RAILROAD GAZETTE

FRIDAY, SEPTEMBER 17.

Comparative Weights of Bridges.

The large diagram which we publish on page 639 has been prepared mainly from the formulæ prepared by George H. Pegram, C. E., of the Edgemoor Iron Co., of Wilmington, Del., and presented by him in a paper before the American Society of Civil Engineers, the more important details of which are abstracted below. The paper was published, with discussions by a number of engineers, in the *Transactions* of that Society for February, 1886.

The greater portion of the lines on the diagram are plotted from tables given by Mr. Pegram. In addition, there is shown:

1. A line giving the weights specified for the double-track bridges of the West Shore Railroad. All the details of the West Shore road are well known to have been planned to be first-class in every respect, and to have been very carefully worked out. Its table of standard bridges, all of which were for double track, were designed for the heaviest class of rolling load, corresponding substantially with the "typical Consolidation" (T) of Mr. Pegram, but a little lighter. We have not at this moment its specifications at hand to give the precise figures. Its bridges will be seen to be a little lighter, although not to any important extent, than Mr. Pegram's weights for single track, with 90 per cent. added for double track, as he suggests.

The West Shore specifications called for rolled I-beams up to 20 ft. span, plate girders from 20 to 50 ft., lattice girders from 50 to 75 ft., and thereafter pin-connected trusses. There was naturally a slight jump in passing from one to the other.

2. We have added lines showing weights according to Austrian practice, as taken from the diagram which was reproduced from *The Engineer* in our issue of July 17, 1885. For these lines we are unable to give the assumed rolling load at all, since, by a very singular omission, it was specified neither on the diagram nor in the article in *The Engineer* which accompanied it. As our heavier rolling loads are all but unknown in Europe, it may safely be assumed to correspond more closely with Mr. Pegram's class M (Mogul and 1,820 lbs. per ft.) than any other.

The Austrian diagrams are for three grand types, parallel girder (the same as all those given by Mr. Pegram), arched girder and bowstring girder, with a number of minor types The diagrams appear to indicate a much greater advantage for curved chords than is found to be the case in American practice with pin-connected bridge.

3. Some examples of actual weights of spans, given by Mr. M. Hughes in a discussion of Mr. Pegram's paper, are shown by crosses and dotted lines. They show for the most part decidedly lighter weights, and on the strength of them Mr. Hughes questions somewhat the accuracy of the formulæ. The discrepancies are satisfactorily explained by Mr. Pegram, however, and numerous other examples given in the discussion do not show material differences. On the whole, Mr. Pegram's results seem likely to be found to closely correspond with general practice, and to be still more closely accurate in respect to the comparative weights for different rolling loads and materials.

The following are the more important parts of Mr. Pegram's paper:

It has been asserted that there is no law governing the variation of the weights of iron and steel bridges, and that, therefore, any formulas purporting to give them with exactness, or even approximate exactness, should be viewed with suspicion.

In the writer's opinion, this feeling at the present day is analogous to the opposition that is made to the use of steel for structural purposes, which does not always involve a proper consideration of the rapid progress which is being made in engineering. The specifications for bridges and the details of construction are now comparatively uniform, and as the individual eccentricities of engineers become confined within narrower limits, the operation of general law is proportionately extended.

The following specifications have been assumed. They might be called standard for this country, in the sense that they are the most usual. Those affecting steel will doubtless be modified, as our knowledge of that metal is increased.

SPECIFICATIONS.

The structure shall be proportioned to sustain its own weight, in addition to the moving load as hereinafter given for its particular class.

In order to provide for the effects of impact, the following percentages shall be added to the strains produced by the moving load considered as static:

For spans under 25 ft.	.....30 per cent.
For spans of 80 ft...	8 "
The added percentage to vary between these limits in proportion to the length of span.	

End suspenders.....	25 per cent.
Middle ties	15 "
First counter-ties...	25 "
Second "	35 "
Last "	50 "

In plate girders, the flange stress shall be considered as borne by the flange without the assistance of the web, and the shearing stress as borne by the web alone.

Under these conditions of loading the stresses shall be limited as follows, viz.:

WROUGHT IRON.—Tension, 10,000 lbs. per sq. in.; shearing, 7,500 lbs. per sq. in.; compression, 8,000 lbs. per sq. in., reduced in columns according to the formula

$$1 + \frac{8{,}000}{a \times \text{least rad. gyr.}^2}$$

in which a = 18,000 lbs. for two pin ends, 24,000 lbs. for one pin end and 36,000 lbs. for two flat ends.

Lateral bracing shall be provided to resist a wind pressure f 30 lbs. per sq. ft. on twice the surface of one truss, together with a moving train surface averaging ten square feet er foot of span.

The stress in lateral rods shall be limited to 15,000 lbs. per sq. in., after adding 10,000 lbs. per rod for adjustment.

Lateral struts shall be proportioned by the above column formula, with 10,000 in place of 8,000 as a basis.

STEEL—Lateral rods, 20,000 lbs. per sq. in. All other parts, 14,000 lbs. per sq. in. in tension, and the same in compression, except in members over sixteen diameters in length, where the column formula for wrought iron, with fifty per cent. added, shall be used.

With some engineers it is customary to vary the unit stresses instead of adding percentages. The result is practically the same, but the system of percentages seems to be more logical, and admits of varying stresses, closely approximating the effects of impact, which it would otherwise be difficult to express.

ROLLING LOAD—In the investigations of which this paper is the result, four classes of loading have been assumed, which will be denoted, for convenience, by the initial letter of the engine used:

Class M.—Two coupled Mogul engines, followed by a train weighing 1,820 lbs. per ft. of track, which was the common loading eight years ago, and is now used on some roads.

Class C.—Two consolidation engines, followed by a train weighing 2,240 lbs. per ft. of track, which has been the usual loading for the past five years.

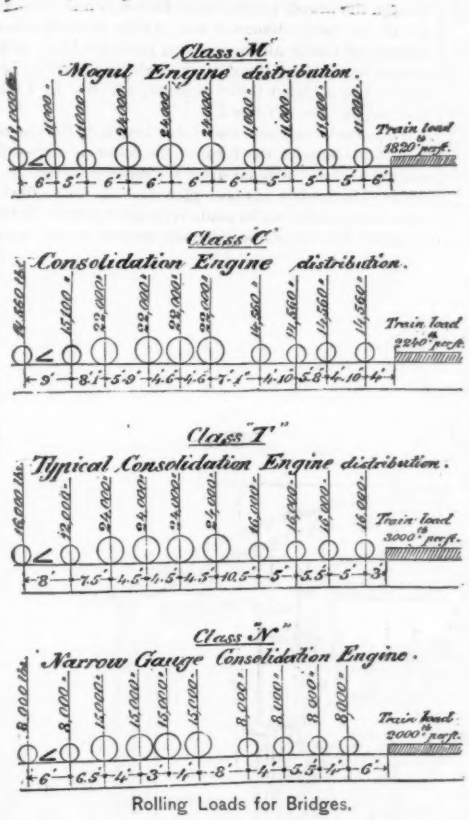
Class T.—Two "Typical" consolidation engines, followed by a train weighing 3,000 lbs. per ft. of track, which is now coming into use, and will probably be the loading for some time to come.

Class N.—Two narrow-gauge consolidation engines followed by a train of 2,000 lbs. per ft. of track.

The distribution of weight in the several classes is shown in the accompanying diagram.

Under these specifications, the weights of bridges given in the following tables have been calculated with every attention to detail, and with a view of obtaining the most economical bridge in each case.

The aim has been to adopt a first-class construction, without any additions of doubtful utility, so that while a bridge might weigh more than that given through some special excellence, it should not weigh much less. This remark should be limited to spans under 300 ft., however, as above that the individuality of engineers becomes more marked, and so much difference of opinion exists as to the proper widths, etc., of bridges, that weights based on one kind of construction would be, in a measure, approximations for another kind.



Rolling Loads for Bridges.

The formulas herein proposed are intended to give the total or shipping weight of iron or steel in the span. Some slight sacrifice of exactness has been necessary, in order to make the formulas as simple as possible.

All efforts to combine the total range of spans under one formula failed. It was necessary to have a formula for girders, and a different one for truss spans, or, what seemed more desirable, a formula which would include both girder and truss spans below 225 feet, which are of the most common occurrence, and a different formula for spans over 225 feet. As far as possible, the same style of formula has been maintained.

The type of bridge assumed is as follows:

For spans below 75 ft., deck-plate girder bridges, 8 ft. wide, connected with angle iron bracing, and with cross-ties resting on the top chords.

Above 75 ft. up to 150 ft.; through truss bridges, Pratt or single quadrangular trusses.

Over 150 ft., Whipple or double quadrangular trusses.

The widths assumed have been: For standard gauge spans under 255 feet, 14 ft. in the clear; for 320 ft. span, 18 feet c. to c. of trusses; for 420 feet span, 21 ft. c. to c., and for 520 ft. span, 25 feet c. to c. The floors of the spans consist of cross floor-beams at the panel points, with a line of iron stringers under each rail, except for spans over 300 ft., which have three lines of stringers.

Differences in depth affect the weight less than would be supposed. Thus in a 60-ft. girder span, for Class T, the difference in total weights between depths of 5 ft. and 5½ ft. was practically nothing, and for an 80-ft. girder span, calculated for Class C, with depths of 6 ft., 6½ ft. and 7 ft., the difference was less than 1 per cent. In a 180-ft. truss span, the difference in weights between depths of 26 and 28 ft. was less than 2 per cent.

In a 520-ft. steel span, for Class T, the difference in weight between a depth of 50 ft. and one of 58 ft., was about 3 per cent.; a depth of 56 ft. was finally taken in this case.

Modifications for other conditions than those may be made as follows.

If wooden stringers are used, deduct 195 lbs. per ft. fo Classes M. and C; 210 lbs. for Class T, and 140 lbs. for Clas N.

For safety stringers add 100 lbs. per ft. for all classes.

For deck truss bridges add 10 per cent., and for double-track bridges 90 per cent. to the formula weight.

Through plate girder bridges will not differ materially from deck bridges in weight, where the cross-ties are made to serve as floor beams; where, however, an iron stringer floor is used, it will be a close approximation to add 200 lbs. per ft. to the weight, as given by the formula.

The following are the formulas proposed: in all of which

S = the span centre to centre of bed plates or end pins, as the case may be.

W = the total or "shipping" weight of iron or steel in pounds.

For iron bridges under 200 ft. span:

$$W = \left(75 + \frac{S}{a}\right) S\sqrt{S} \qquad (1)$$

in which,

a = 7. for Class T.
" = 9. " " C.
" = 12. " " M.
" " N. take three-fourths

of the weight as given for Class T.

For iron bridges over 200 ft. span:

$$W = \left(5. + \frac{S}{b}\right) S^2$$

in which b = 100 for Class C.
" = 80 " T.

For steel bridges over 300 ft. span:

$$W = c\,S^2$$

in which c = 6. for Class C.
" = 6.7 " T.

The formulas for spans of over 200 ft. were framed on independently calculated spans, in order to secure uniformity of conditions. Prototypes of the iron spans of 320 ft. and under, with two exceptions, have been built within the past five years, and the formulas have otherwise been checked on over eighty spans built or designed within that time. The weights for steel spans are based on bridges which have been completely designed, but not built. They are of a very high type of construction. A frequent difference between the formula weights and those of existing bridges is caused by the custom which prevailed at one time, of assuming the webs of plate girders to assist the flanges and reducing the sections accordingly.

The paper includes three tables showing for 14 different spans between 20 and 320 ft., the weight of actual examples of constructed bridges of each span and of each of the four types; the weight given by his formula, and the percentage of error in the latter, which ranges for the most part from 1 to 3 per cent. above or below the actual, or not over the limits of variation in different designers. Some of these actual examples, where they differed from the computed, are shown on the diagram by points in triangles. The formula given "for bridges under 200 ft. span" begin to fall too low above 175 ft., being about 2 per cent. too small for all types at 200 ft.

The relative loads may be tabulated as follows:

Class.	2 Engines.	Lbs. per ft. Engine.	Cars.	Average.
T	344,000 lbs. on 105 ft.....	3,276	3,000	3,138
C	322,680 " " 103½ "	3,118	2,240	2 679
M	276,000 " " 100 "	2,760	1,820	2,290
N	200,000 " " 90 "	2,200	2,000	2,111

Ratio of loads per ft., taking T = 100.

Class.	Engine.	Cars.	Average.
T.....	100.	100.	100.
C.....	95.15	74.67	85.37
M.....	84.25	60.67	72.98
N.....	67.83	66.67	67.27

For bridges of less than 150 ft. span, the only part of the rolling load which affects the weight of the bridge greatly is the engine load. For spans of over 200 or 250 ft., an average of the engine and car load per ft. will come nearer to expressing the ratio by which the weight of the bridge is affected.

The following shows the comparative weights of bridges of various spans for these various rolling loads, taking a bridge of "T" (typical consolidation) type as unit:

Minor spans:

	30 ft.	50 ft.	80 ft.	104 ft.	150 ft.	201½ ft.
T.....	100	100	100	100	100	100
C	98.74	98.05	97.10	96.33	94 98	94.00
M.....	97.73	96.47	94.56	93.16	90.75	88.61
N.....	(Uniform at 75.00)					

Larger spans:

	201½ ft.	320 ft. Iron.	320 ft. Steel.	420 ft. Iron.	420 ft. Steel.	516 ft. Iron.	516 ft. Steel.
T.....	100	100	100	100	100	100	100
C.....	93.34	91.11	89.55	88.77	89 55	88 21	89.55

For these larger spans it will be seen that a car load 25½ per cent. less and an engine load 5 per cent. less reduce the total weight of the bridge by about 10 per cent. only, while for the smaller spans the differences are very small, even between the extreme loads of a rather light Mogul and the very heaviest weight of engine.

It will be observed that the narrow-gauge weights are low out of all proportion to the difference in the load, which we may reasonably infer is because the formulas and diagrams represent, not what ought to be, but what is, and narrow-gauge work has been habitually more skimped. It was not deemed necessary to do more than take a few examples of what had been designed or furnished for narrow-gauge lines, and fit a very rudely approximate formula to them.

In the discussion of the paper, Mr. John S. Elliott gave a number of examples showing variations within 5 per cent. either way, and suggested an extension of the formula to iron trestles. "Working up some 34 viaducts on the Cincinnati Southern," he found "$W = (S + S')\,250$, in which S= total length of viaduct, centre to centre of end pins, and S'= sum in feet of profile bent heights from top of masonry pedestals to top of columns (W = weight of metal in pounds) gave results with a variation of error of 6 to 12 per cent." On the highest viaduct of the lot, 128 ft., the error was 11 per cent. in deficiency, showing the necessity of a change of formula to suit great heights. The Kinzua Viaduct, 302 ft. high, fell 33 per cent. short.

Mr. Pegram, in reply, points out that the formula implies that the weight of bents and of span is the same per foot,

whereas the latter will actually weigh 50 per cent. more than the bent. In ordinary trestles the proportion of bent to span is such that the formula gives very good results, but he suggests

$$W = (3\,S + 2\,S')\,110$$

as a better formula, in which S' is taken at distances 80 ft. apart, regardless of the actual spans.

Mr. Pegram then suggests that, as respects draw-bridges, it will be sufficient to say that the total weight of a draw-bridge, including turn-table, wheels and machinery to turn by hand, will be the same as that of a fixed span of the same total length for the same live load. This he found to be remarkably exact in a number of spans of 150 to 400 ft., both single and double track.

The Work of the Car Accountants' Association.

At the annual meeting of the Car Accountants' Association, held in Buffalo last June, E. T. B. Glenn, Cape Fear & Yadkin Valley Railway; W. A. Moody, Richmond & Danville Railroad, and E. B. McDaniel, Atlanta & West Point and Western Railway of Alabama, were appointed a Special Committee to confer with the managers of such roads as do not belong to the Association, and endeavor to persuade them to join. With this object in view they have issued the following circular letter:

The object of this Association is for the improvement of car accounts and the promotion and advancement of car service in general. Recognizing the fact that "in unity there is strength," in 1876 a small band of car accountants organized an Association with Mr. H. T. Curd, of the Louisville & Nashville Railway, as Chairman, and Mr. F. M. Luce, of the Chicago & Northwestern Railway, as Secretary. The Association has steadily grown in numbers, as well as in favor, until it counts three-fourths of the roads and lines in the United States and Canada as its members.

The good effects of this Association have been felt everywhere. Car records have been simplified, a perfect system of car-tracing has been introduced, enabling some roads to do away with lost car agents; and last, but not least, a uniform rate of car mileage has been agreed upon which bids fair to give universal satisfaction. At our annual meetings a member of the Association has the advantage of comparing his forms and of hearing expressed the practical experience of car accountants from all portions of the United States and Canada. Certain important topics for discussion are arranged for by a committee before the annual meeting and each member furnished with a copy, so that each can get the opinion of the Manager of his road. Any member, however, has the right to introduce any subject bearing upon car accounts during the meeting of the Association.

Any Car Accountant or officer in charge of car accounts may be a member of this Association, or any officer or person delegated by the manager of a company may be a member.

Membership is obtained by signing the constitution or by empowering the Secretary of the Association to do so for you. The dues are very light. For the year 1886 they are only $5. There is no initiation fee; you simply pay your dues when you join.

You will see from this that great benefits are derived for a very small outlay. The actions of the Association are not binding upon the roads or lines that belong to it, but, like other associations of similar character, its actions are simply recommendatory.

Our next annual meeting will be held in Atlanta, Ga., on the third Tuesday in April, 1887, and we sincerely hope to there meet a representative of your road.

Should you desire to answer this, and we hope very much that you will, address E. T. B. Glenn, Car Accountant, C. F. & Y. V. Ry., Fayetteville, N. C.

Consolidation Locomotive, Class R, Pennsylvania Railroad.

The engravings represent the latest improved form of heavy freight engine built by the Pennsylvania Railroad; the first sample engine, No. 400, having been built at the Altoona shops in 1885. The Pennsylvania was nearly the first railroad to adopt the Consolidation type of engine (four pair of drivers coupled and a two-wheeled truck). One of its standard, Class I, Consolidation engines was exhibited in the Centennial Exhibition in Philadelphia, in 1876. The differences in the design of the details of the two engines are very striking, and form an excellent example of the progress made during the last ten years in locomotive construction. Though the wheels are the same diameter, and the cylinders are of the same diameter and stroke in both classes, the strength of nearly all the working parts has been largely increased in the Class R engine, and additional power has been obtained by a higher boiler pressure, 140 lbs. in Class R in place of 125 lbs. in Class I.

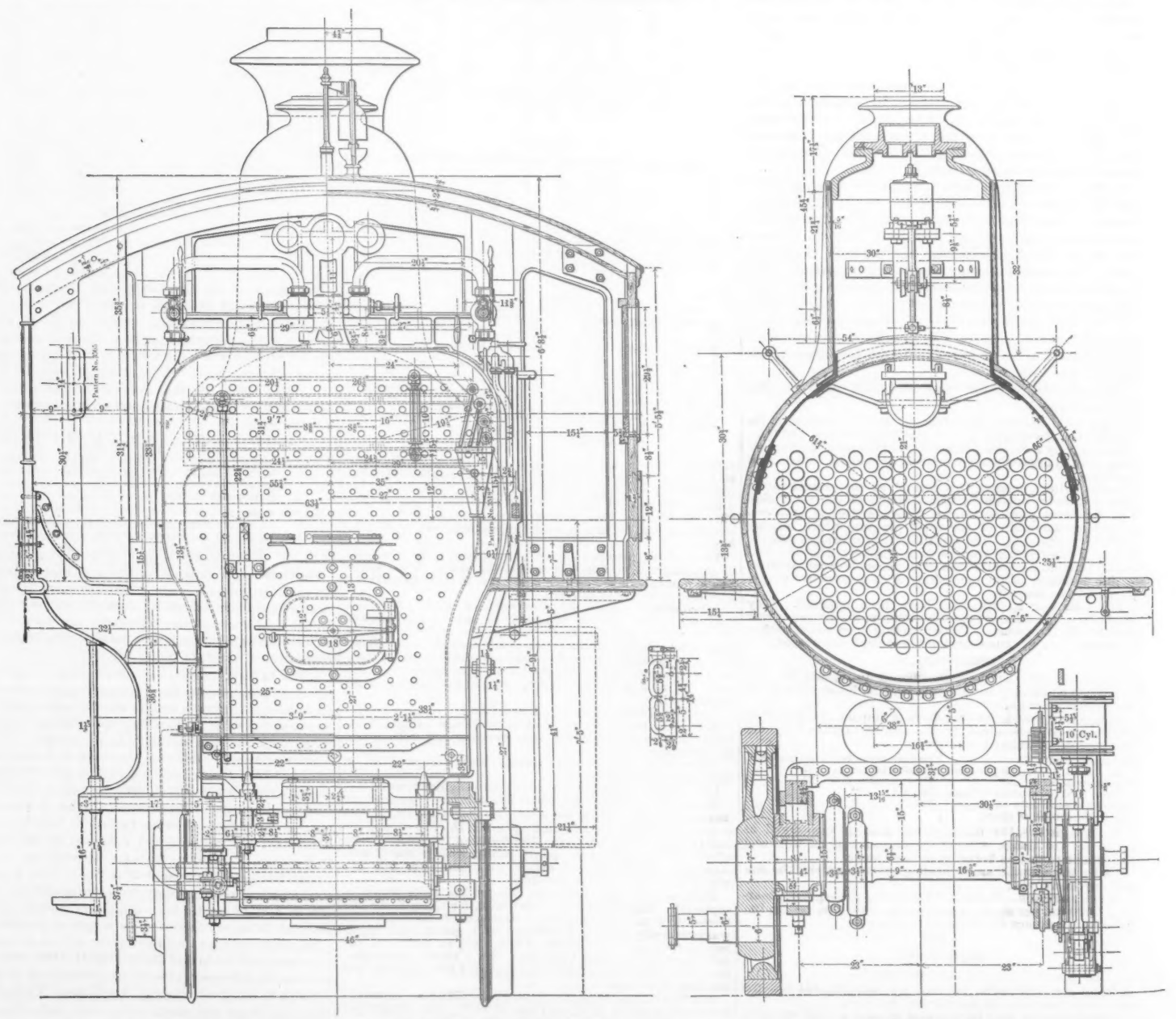
While the wheel-base and total length of the engine have been little changed, the form of the boiler is very different, and the increase in steam space and heating surface is considerable. The fire-box has been placed wholly above the frames, and consequently can be made very much wider. In the Class I engines the roof of the external fire-box sloped downward toward the back end and provided a very small allowance of steam space over the fire-box, where the generation of steam is most active. In the Class R engines, on the contrary, the top of the fire-box casing is rectangular, giving ample room for the steam. The barrel is nearly 6 in. larger in diameter, and consequently a larger number of tubes can be accommodated. The heating surface both of flues and fire-box is considerably greater, and as the grate surface is very large, the engine ought to steam very freely with a large blast-nozzle. The blast-nozzle is not, however, much enlarged, and is still considerably smaller than the area of the steam pipe. The ports in the cylinder are also of moderate size (17¼ in. × 1¼ in.) for such a large cylinder. The ports are thus $\frac{1}{14.5}$ of the area of the cylinder, a proportion which is often found in locomotives, but is less than is usually allowed in marine and stationary engines. The passages in the saddle from the steam-pipe to the valve-chest, and from the exhaust-port to the blast-pipe have been carefully arranged, and their area appears ample.

The arrangement of the smoke-box and stack differs radically in the two classes. Low nozzles, a petticoat pipe, and a diamond stack have given place to high nozzles, extended front, and taper stack. The diameter of the latter is less than that of the cylinder. Some account of the saving in fuel effected by using a somewhat similar stack and a large blast-nozzle may be found under the account of the experiments made by Mr. Charles Blackwell on a Consolidation engine of similar size for the Norfolk & Western Railroad, described and illustrated in the *Railroad Gazette*, for May 15, 1885. The Pennsylvania Consolidation has been improved by some alteration in this direction.

In the Class I engine, all the springs for the driving-wheels were of similar size and were placed above the axle-boxes. In order to get the fire-box above the frames the springs of the main and hind drivers in the Class R engine are placed beneath the frame in a manner similar to that adopted for the Norfolk & Western Consolidation.

The outlines of the dome-casing, sand-box and chimney resemble those usual in English practice, all moldings being abolished for easy flowing curves. The general appearance of the engine is very good, and in this respect also this class is a great improvement on its predecessor.

The following comparative table shows the changes made



Rear Elevation. *Section Through Rear of Cab.* *Section Through Dome.*

CROSS SECTIONS, CONSOLIDATION LOCOMOTIVE, CLASS R, PENNSYLVANIA RAILROAD.

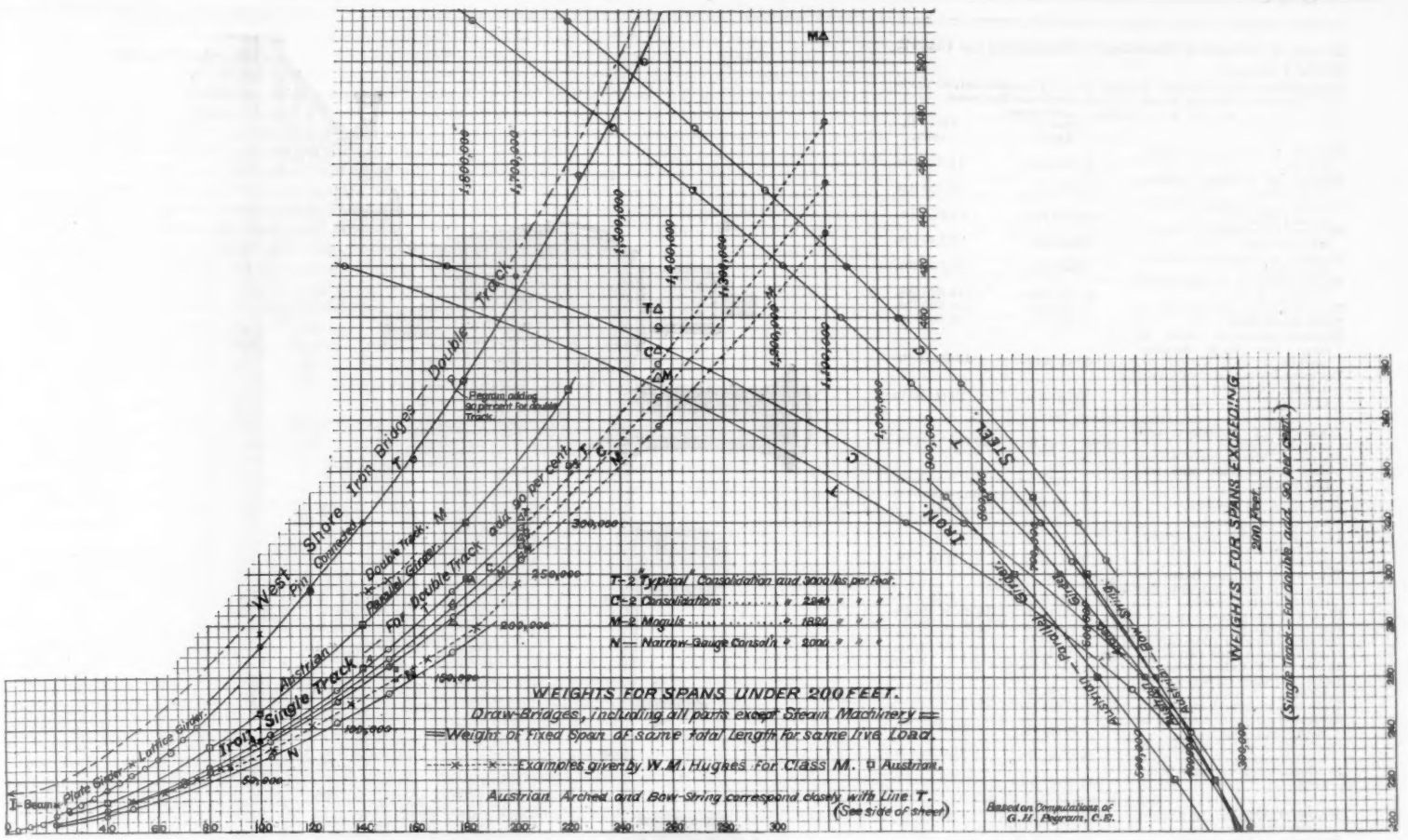
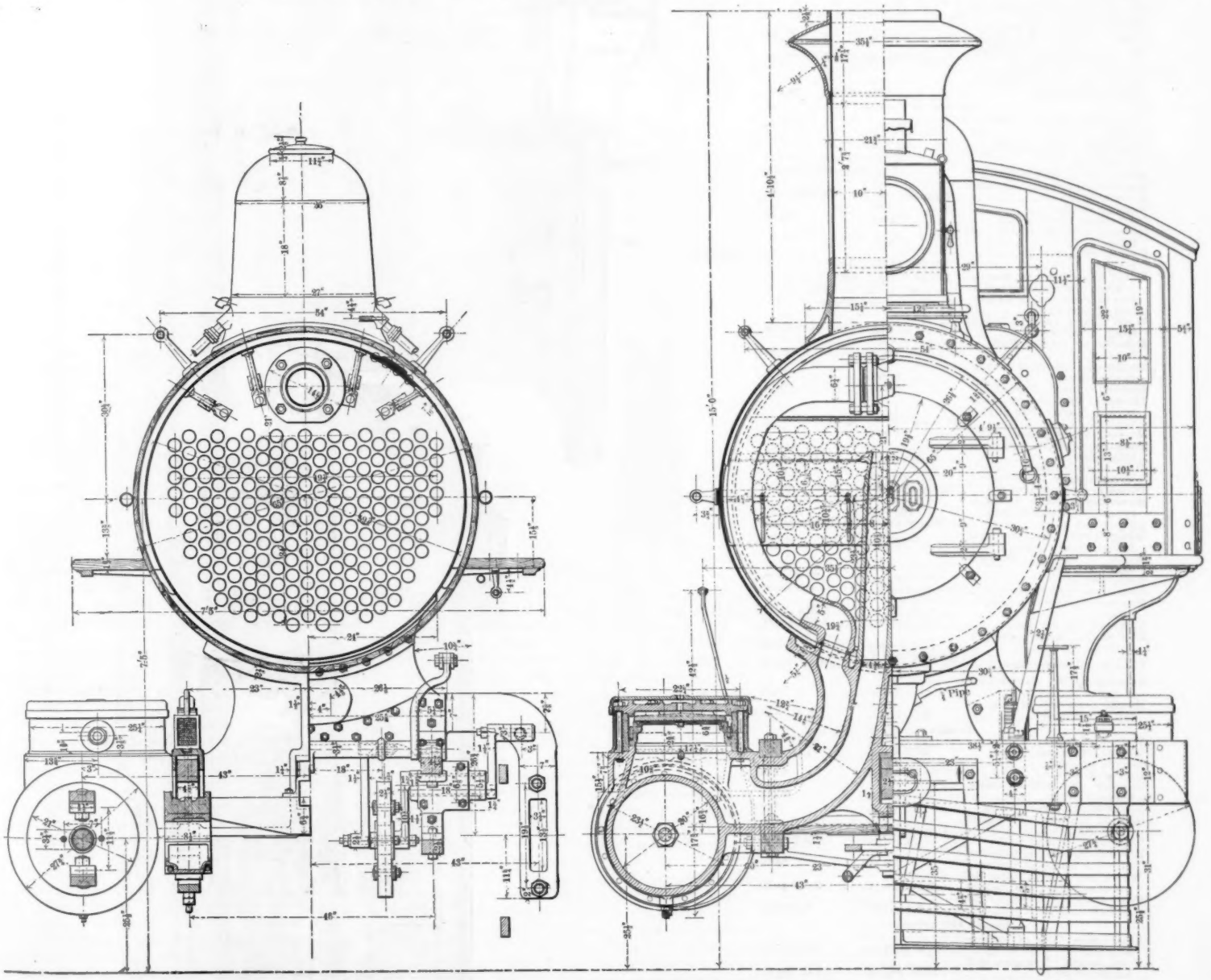


DIAGRAM OF THE TOTAL SHIPPING WEIGHTS OF IRON OR STEEL IN BRIDGES OF VARIOUS MATERIALS AND FOR VARIOUS ROLLING ROADS.

(For spans exceeding 200 ft. the right hand edge is the base line, and the vertical scale is reduced one-half.)



Section Through Front Driving Axle. *Section in Front of Guide Yoke.* *Section Through Centre of Cylinders.* *Front Elevation.*

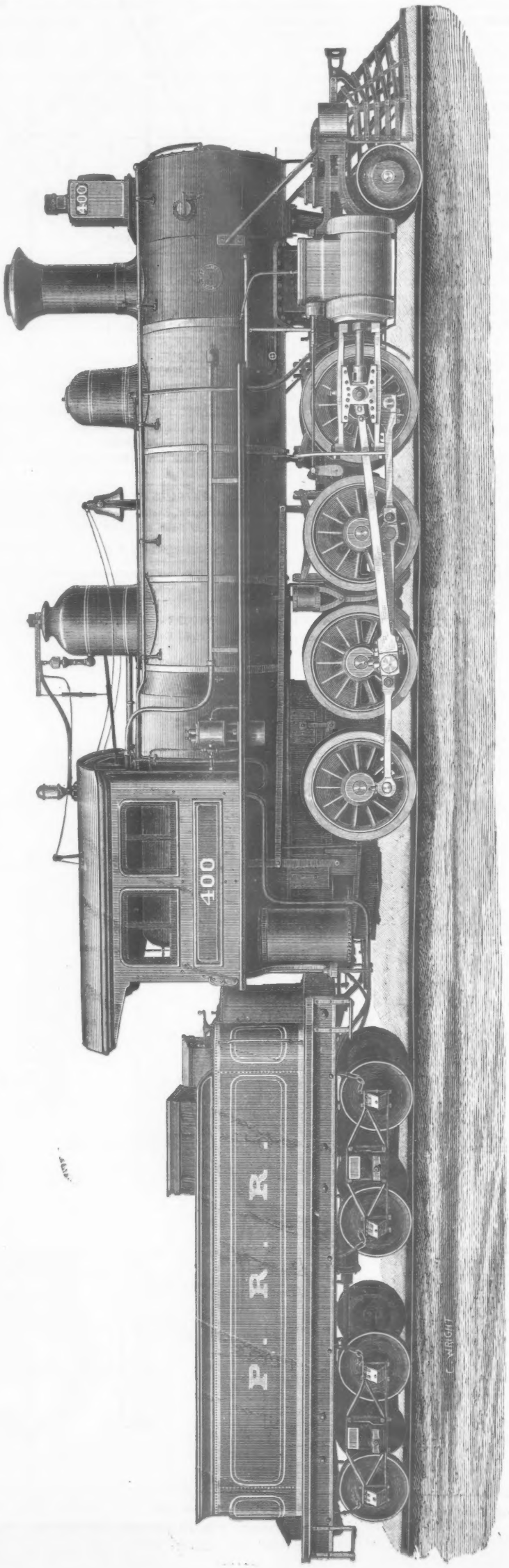
CROSS SECTIONS, CONSOLIDATION LOCOMOTIVE, CLASS R, PENNSYLVANIA RAILROAD.

in some of the leading dimensions in substituting the Class R for the I engines:

Comparative Dimensions, Weight, etc., of Consolidation Locomotives Classes I and R, Pennsylvania Railroad.

	Class I. 1876.	Class R. 1880.
WEIGHT AND GENERAL DIMENSIONS.		
Weight in working order: Truck	12,240 lbs.	14,025 lbs.
Weight in working order: First drivers	21,580 lbs.	24,225 lbs.
Weight in working order: Second drivers	19,200 lbs.	23,875 lbs.
Weight in working order: Main drivers	19,540 lbs.	26,750 lbs.
Weight in working order: Hind drivers	19,080 lbs.	25,750 lbs.
Total weight of locomotive in working order	91,640 lbs.	114,625 lbs.
Total weight on driving-wheels	79,400 lbs.	100,600 lbs.
Total wheel base	21 ft. 6 in.	21 ft. 0 in.
Distance between centre of front and back driving-wheels	13 ft. 8 in.	13 ft. 10 in.
Distance from centre of main driving wheels to centre of cylinders	13 ft. 6 in.	13 ft. 10 in
CYLINDERS, VALVES, ETC.		
Diameter of cylinders and stroke of piston	20 in. × 24 in.	20 in. × 24 in.
Horizontal thickness of piston over piston-head and follower plate	5¾ in.	6¾ in.
Kind of piston packing	Spring	Steam; cast-iron rings
Diameter of piston-rod	3¼ in.	3¼ in.
Length of main connecting-rod from centre to centre of journals	9 ft. 4 in.	9 ft. 7 in.
Transverse distance from the centre of one cylinder to the centre of the other	7 ft. 0 in.	7 ft. 2 in.
Size of steam-ports	17¼ in. × 1¼ in.	17¼ in. × 1¼ in.
Size of exhaust ports	17¼ in. × 2½ in.	17¼ in. × 2½ in.
Greatest travel of slide-valves	5 in.	5 in.
Outside lap of slide valves	¾ in.	¾ in.
Inside lap of slide-valves	1-32 in.	None
Lead of slide valves in full stroke	⅛ in.	1-16 in.
Slide-blocks, length and width	24 in. × 4½ in.	24 in. × 4½ in.
Sectional area of opening in each steam-pipe	18 sq. in.	19.6 sq. in.
Sectional area of opening in each steam-port	21.6 sq in.	21.6 sq in.
Sectional area of each blast-nozzle	11.2 sq. in.	13.8 sq. in.
WHEELS, ETC.		
Diameter of driving-wheels, outside of tires	50 in.	50 in.
Diameter of truck wheels	28 in.	28 in.
Size of driving-axle journals, diameter and length	6¼ in. × 7¼ in.	7 in. × 8⅝ in.
Size of driving axles in centre and in wheel	6½ in.	6½ in. × 7 in.
Size of truck-axle journals, in centre and in wheel	4¾ in. × 7 9-16 in.	5 in. × 8 9-16 in.
Size of main, crank-pin journals, in centre and in wheel.	4½ in. × 5 in.	5 in. × 6 in.
Size of coupling-rod journals in centre and in wheel	3½ in. × 3½ in.	3½ in. × 3½ in.
Length of driving-springs, measured from centre to centre of hangers	36 in.	36 in. × 3½ in.
BOILER.		
Inside diameter of smallest boiler ring	58⅜ in.	59 in.
Material of barrel of boiler	Steel	Steel
Thickness of plates in barrel of boiler	⅝ in.	½ in and 7-16 in.
Kind of horizontal seams	Lap.	Butt, welted inside
Kind of circumferential seams	Lap.	Lap.
Material of tubes	Wrought iron	Wrought iron
Number of tubes	138	183
Diameter of tubes outside	2⅛ in.	2¼ in.
Distance between centres of tubes	3⅛ in.	3⅛ in.
Length of tubes over tube-plates	12 ft. 11 in.	13 ft. 1 13-16 in.
Size of fire box inside, length × width × depth from under side of crown-plate to bottom of mud-ring	96 in. × 34½ in. × 42 in. to 61 in.	107 in. × 42 in. × 57½ in. to 59½ in.
Water spaces, sides, back and front of fire-box	3¼, 4, 4 in.	3½, 4½, 4½ in.
Material of outside shell of fire box	Steel	Steel
Thickness of plates of outside shell of fire-box	⅝ in.	⅝ in.
Material of inside of fire-box	Steel	Steel
Thickness of plates in sides, back, end and crown of fire-box	5-16, 5-16, 5-16 in.	¼, 5-16, 5-16 in.
Material of tube-plates	Steel	
Thickness of front and back tube-plates	½ in., ½ in.	½ in. ½ in.
How is crown-plate stayed, with girder or screw-stays?	Screw.	Screw.
Diameter and height of dome	30 in. × 32 in.	30 in. × 32 in.
Maximum working steam pressure per square inch	125 lbs.	140 lbs.
Kind of grate	Water grate	Shaking grate
Width of bars (or diameter of tubes of water grate)	1⅞ in.	1¼ in.
Width of opening between bars (or tubes)	1 in.	½ in.
Grate surface	23 sq. ft.	31.2 sq ft.
Heating surface in fire-box	92 sq. ft.	167 sq. ft.
Heating surface of outside tubes	1,166 sq. ft.	1,564 sq. ft.
Total heating surface	1,258 sq. ft.	1,731 sq. ft.
Kind of blast-nozzle, single or double	Low double	High double
Diameter of blast-nozzle	Rectangular, 3 in. × 3¾ in.	3¼ in. × 4¼ in.
Smallest inside diameter of chimney	20 in.	18 in.
Height from top of rails to top of chimney	14 ft. 11 in.	15 ft. 0 in.
TENDER.		
Weight of tender, empty	22,770 lbs.	23,800 lbs.
Weight of tender, loaded	55,730 lbs.	57,800 lbs.
Length of tank	19 ft.	19 ft.
Height of tank	43 in.	43 in.
Number of wheels under tender	Eight.	Eight.
Diameter of tender wheels	33 in.	33 in.
Size of journals of tender axles, diameter and length	7 in. × 3½ in.	7 in. × 3½ in.
Total wheel-base of tender	ft. in.	15 ft. 4 in.
Distance from centre to centre of truck wheels of tender	58 in.	58 in.
Water capacity of tank (in gallons of 231 cubic inches)	3,000 galls.	3,000 galls.
Coal capacity of tender or fuel-bin	8,000 lbs.	8 000 lbs.
ENGINE AND TENDER.		
Total wheel-base of engine and tender	47 ft. 7 in.	48 ft. 9 in.
Total length of engine and tender all over	56 ft. 9⅝ in.	58 ft. 5½ in.

The accompanying illustrations and the preceding description of this fine engine, one of the latest examples of the typical freight engines of this country, is likewise given in the enlarged edition of "Recent Locomotives," just published. We shall shortly present further engravings of the details of this engine.



CONSOLIDATION LOCOMOTIVE AND TENDER, CLASS R, PENNSYLVANIA RAILROAD.

Contribution.

Official Negligence.

SIBERIA, September, 1886.

TO THE EDITOR OF THE RAILROAD GAZETTE:

A little communication in your issue of July 30 attracted my notice the other day and reminded me that the railroad managers of your country are still in need of a more or less hearty dose of "frozen truth" on some topics, as the comic papers would term it; and refrigerating processes of all kinds being naturally cheap in this country (whatever may be said about the supply of material to freeze), I take the liberty of sending you a few observations. Things certainly do look differently when one stands off at a calm distance, and I will thank you to recall this fact to your superintendents and other so-called managing officials whose field of vision is bounded by some president's or general manager's coat-back seams only two feet ahead of him. To be sure, I have seen no great results from a little good advice I sent you some time ago, but I am not yet discouraged.

I refer now to the letter of the correspondent who asked why the whistle orders of the Erie were renewed instead of enforced. This would perhaps be a question of small importance were it not for the fact that railroad practice as exhibited in this case is well known to be equally weak in many more serious matters.

Where one has no authority, as in running a free singing school or in extracting "voluntary" contributions from government clerks, it is indeed good practice to hint instead of to urge; to gently excite the auditory nerve rather than pound the olfactory (on the exterior) or risk the possibility of antagonizing the will in any way; but to people who are in the habit of giving orders with a view to having them complied with, who, when they instruct a careless person, act on the dictates of the simplest common sense and follow up that careless person (perhaps even if he be a *generally* careful servant), and find out what degree of obedience he renders; who in the conduct of their own business find it destructive of all system and discipline to have subordinates pursuing lines of conduct which they (the masters) know nothing about; to such, I say, it seems strange and inexplicable that the valuable property interests and the prodigious responsibility for human lives intrusted to railroad officers should be so lightly treated. For rules requiring vigilance in observing signals, where safety of life is involved every day, are allowed to go unenforced in precisely the same manner that we have seen in the above-cited instance. A dull-minded engineman goes by a fixed signal without fully realizing its importance and without taking proper and prompt care to look at it; and, familiarity breeding contempt, he grows less and less vigilant, until in time an "accident," more or less serious, exposes his fallacious reasoning (or habit of not reasoning). Every month you report a lot of derailments from misplaced switches, and yet a very great proportion of all the railroad managers go on in entire ignorance of how well their switchmen guard their switches—in fact not knowing whether they guard them at all, in many instances. A *comparatively* high degree of immunity from disaster and a consciousness of having selected the best men available seems to be relied upon as sure evidences of duty fulfilled by the officers of the more prosperous roads; men otherwise intelligent seeming to forget that mere good luck often shows the apparent results of good wit, and disregarding the plain truth that lax methods, and consequent falling short of a high standard of excellence, are in no degree palliated by the fact that their poor neighbors are still more thoughtless and sleepy than they are. What these latter do for a sedative for their consciences it would be hard to divine. Serious and important matters affecting the safety of trainmen, and perhaps passengers, are often left to the sole judgment of one man, who, for aught the directors know to the contrary, may have large areas of old fogyism in his make-up.

Now, why are these things so? Do superintendents and their assistants deliberately neglect precautions which any ordinary mind can see are plainly necessary? Do they think that their present ways are best? Various answers will be given to this question; I merely wish to give a little of my experience, knowing that many will agree with me, although they may not heretofore have formulated their thoughts in words.

One constant and insidious cause of one-sided thinking and consequent unbalanced action is the persistent blinding effect of superficialities; in this as in other activities, the things on the surface take our attention away from those underneath. When I am acting as division superintendent I do indeed recollect that I am responsible for safety and efficiency, but in aiming to satisfy and please the general manager or president it is perfectly natural to try to please him in *everything*; and his request for a special car for himself, or for some little change in the drawing-room car arrangements, or in the management of the train porters to better cater to the nabob passengers, may very easily, if I am an ordinary weak mortal, absorb my attention, to the exclusion of vital business affairs. This is no fiction of a morbid imagination. Common experience testifies that operating officials, like many lesser folks, often make it their chief aim to "render themselves solid" with their immediate superiors; and if assiduous attention to the latter's wife and children on a trip to the sea shore seems to be more effective than sitting up nights to devise improvements in administration, the *natural* choice is more than likely to prevail. And as very few high officials are thoughtful enough to correct their subordinates' views on these matters, or far-seeing enough to discern the necessity for it, it comes about that multitudes of men are neglecting the thought, observation and reflection that should improve their efficiency as officers while they are studying to perfect themselves as body-servants or errand-boys. I don't know that any of these strictures apply to the Pennsylvania Railroad, whose loose management you recently showed up so tellingly, but its high reputation certainly has rested largely on its gorgeous cars, "Chicago Limited," polite and elegant servants, bureaus of information and cognate features, all which are excellent in themselves, but unquestionably should be subordinated to considerations of safety to life and limb. There is ample room for suspicion that time has been spent on these things that might profitably have been devoted to the inspection of the train-dispatcher's department. Double and quadruple tracks are very desirable things, but having them on the main line does not remove the necessity for the use of brains on the single-track branches and subdivisions, nor alter the ancient axiom that the meeting of trains on the latter, where there is no side-track, is likely to be extremely destructive to headlights and "cow-catchers."

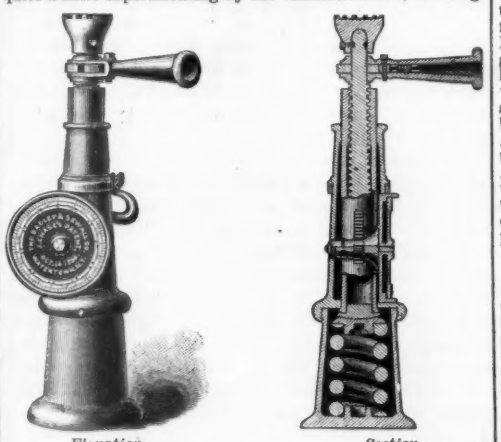
But I see I am spreading beyond all reasonable limits, and shall have to hire a sheet, after the manner of the rail joint people, if I don't stop. Mention might be made of the narrow-minded way in which a great many managers fill up their division superintendents' time with petty details of buying supplies and of saving the time of dollar-a-day employés when they ought to be in better business, but interested readers can recall the facts without assistance. I might speak of the numbers of train-masters and others who have not sufficient confidence in themselves to propose radical reforms even where they are conscious of the need of them; who have been promoted because of their reputation for executive ability rather than for any known logical or scientific mental habits or other qualifications for the consideration of the diverse problems that come up at "headquarters;" but perhaps some of them may be prompted to send in some confessions, and thus give enlightenment from original sources. On many roads reputed to be "the best," such really important duties as examining employés, searching for hidden defects or for chances to remedy little evils are generally taken up only as "odd jobs"—attended to when there is nothing else on hand. This is a fact—I have been in the United States quite recently. Perhaps some director will enlighten the world through your columns, as to the reasons for this superficial way of doing business.

CZAR.

[It is perhaps due to His Imperial Majesty to say that he could not take the Silver Creek accident for his text, because he wrote before it happened.—EDITOR RAILROAD GAZETTE.]

Chase Lifting and Weighing Jack.

The device illustrated is said to be accurate and durable, as it is plainly portable and light, and is the final result of quite a little experimenting by the manufacturers, the Bagley & Sewall Co., of Watertown, N. Y. A jack of an earlier form but substantially the same device was exhibited at the Master Car-Builders' convention two years ago.



Elevation. *Section.*

Chase Lifting and Weighing Jack.

The mechanism of the device is sufficiently clear from the section. The lift is by a screw worked by a ratchet, the female screw being in a sleeve which slides up and down within the outer case of the jack, and rests on a stiff spiral spring at the bottom. As the sleeve settles under a load a rack attached to it works an index point, which indicates the weight on a register like any other spiral spring scale.

The sleeve has a bearing surface at its upper end only, to reduce friction, and the ball and socket-like device by which the weight is transferred to the spring insures against binding, it is said, so that the jack will in practice weigh accurately. A small spring takes up any lost motion in the index rack and pinion, always in one direction, so that it may not affect the accuracy of the register.

With three or four of these jacks any car or heavy piece of machinery can be readily weighed, with of course a minimum of trouble, and since it is impossible to have a track-scale everywhere, the convenience of having a few sets of these jacks, which can be sent from point to point as they are needed, or placed permanently at minor stations from which a great deal of bulk freight is sent, which it would otherwise be impossible to bill correctly, is obvious.

This, of course, is on the assumption that the indicated weights are in practice correct. As to that, we cannot speak from knowledge, but as from three to four jacks are used ordinarily for heavy weighing, the average probable error is by so much reduced, and we are assured that the scale is made practically exact, while the inconvenience of its use is so little that the manufacturers make a practice of weighing every car-load of freight received or shipped by them, often discovering surprising discrepancies. That the latter should be true, will not surprise many railroad men.

Various sizes of the jacks are made, ranging from 1,200 lbs. to 15 tons capacity, or larger if required.

What Speed Costs in Atlantic Steamers.

In a review of two papers on Atlantic steamers recently read before the British Institution of Naval Architects, the *Engineer*, of London, says:

One of the first things to suggest itself about such ships as the "Etruria" or the "Umbria" is the vast cost at which their efficiency has been obtained—a cost which no one in his senses would have suggested a quarter of a century ago. We do not here so much refer to the outlay of capital on ships and engines, enormous as that is, as on the working expenses. Let us compare the performance of the "Etruria" with that of the "Britannic." An interval of nearly 10 years separates the construction of the two ships. The "Britannic" is still running. Her consumption is, we believe, about 90 tons of coal per day of 24 hours. Her passages average 8 days 9 hours outward and 8 days 2 hours homeward. Her consumption may, allowing for getting up steam, etc., to be taken at 840 tons per voyage. The "Etruria's" fastest passage has been 6 days 5 hours 31 minutes. Her average we do not know, but we shall not be far wrong if we call it 6 days 12 hours. She burns 320 tons of coal per day of 24 hours, or, making allowance for getting up steam, etc., 2,250 tons of coal on the trip. She makes the passage in a day and a half less than the "Britannic." To save this day and a half, the consumption of coal is augmented by no less than 1,400 tons. That is to say, the consumption has been nearly doubled to save 36 hours in time. This is startling enough, but figures yet more remarkable may be obtained. Let us take, for example, the "Servia," and compare her with the "Etruria." The best passage of the latter is, in round numbers, 6¼ days; the best passage of the former is, also in round numbers, 7 days. Using the figures given by Mr. John, of the Barrow Shipbuilding Company, and neglecting coal spent in getting up steam, etc., we have for the "Etruria." 315 × 6.25 = 1,968.75 tons; and for the "Servia," 205 × 7 = 1,435. That is to say, over 500 tons of coal are expended in shortening the passage by 18 hours. It may be urged that this is not all, and that the difference in the dimensions of the two vessels must be taken into account. But it so happens that the "Servia" is a larger ship than the "Etruria," the displacement of the former vessel being 10,960 tons, and of the latter 9,860 tons, or 1,100 tons less. The indicated horse-power of the "Servia" is 10,300, and that of the "Etruria" 14,321. The latter ship has 1.45 indicated horse-power per ton of displacement; the former a little less than 0.94 indicated horse-power per ton of displacement.

The enormous increase in horse-power required to put on a knot or a fraction of a knot in speed explains the difference in the coal consumption of the two ships. Nor does the additional expense end here. It will be seen that not only can the "Servia" make a trip with 500 tons less coal than the "Etruria," but she has available for some purpose or another 1,100 tons more displacement. Part of that can be devoted to cargo, part to passenger space, even after due allowance is made for the greater weight of the hull. But, furthermore, the boilers and engines of the "Etruria" weigh a great deal more than do those of the "Servia." The more carefully we investigate the construction and performance of the two ships the clearer does it become that the price paid for reducing the time of transit between Liverpool and New York seems to be out of all proportion to the result gained. If such a ship as the "Etruria" can be made to pay her way, then the profit earned by such a vessel as the "Servia" must be very large, while that earned by the "Britannic" ought to be colossal. We believe that the truth lies between the two statements, and that the fastest ships in the Atlantic trade are partly supported out of the earnings of their slower sisters. Mr. John has hinted that the express Atlantic steamer of the future will carry no cargo; and this, we think, is more than probable. If any ship is built to beat the "Etruria," it is clear that there will be no space left for cargo—engines, boilers and coal demanding every ton of displacement available.

Proportions of English Locomotives.

It is a noteworthy fact that however much change may be effected in the type of a locomotive, certain proportions appear to be incapable of alteration without doing harm; 2½ square feet of heating surface ought to be provided for each square inch of piston area, or, what comes to the same thing, the area of one piston multiplied by 5 will give the proper heating surface. Thus, the area of a 17-in. piston is 227 square inches, and 227 × 5 = 1,135 square feet. An 18-in. cylinder has an area of 254.4 in. and 254.4 × 5 = 1,272. In like manner, the proper surface for 19-in. cylinders is 1,417 square feet. Of course this is not to be regarded as a hard-and-fast rule, but it will be found that it is quite in accord with the best locomotive practice of the day, and that when an attempt has been made to reduce the proportion, the engines have not proved good steamers with heavy trains. On the Great Southern & Western Railway of Ireland 18-in. cylinders go with 1,050 ft. of surface, but the stroke is only 24 in. On the Great Eastern Railway we have 1,200 ft. with an 18-in. cylinder, 26 in. stroke, and on the Brighton Railway, 1,485 ft., with an 18¼ cylinder, 26 in. stroke. It must not be forgotten, however, that a boiler with too little heating surface may be made to steam better by increasing the size of the fire-box, and we could name instances where locomotives have been greatly improved by having had the backs of the fire-boxes taken out and the fire-boxes lengthened 12 in.—*London Engineer.*

Forty-ton Cars.

At the Allegheny shops of the Pennsylvania Co. have been built recently a number of cars especially intended to carry iron ore from Lake Erie, thus described by the Cleveland *Leader and Herald*: "The car has three Findlay & Conger centre support trucks, two axles to the truck, and the side bearings have a number of small iron balls laid in a slot so that the great weight may move with as little friction as possible. The body is made extremely rigid by a system of double and counter bracing, and the floor, instead of being flat, slopes sharply from the centre to the sides, practically dividing the car into two compartments. Each of these is in turn partitioned into five spaces, making the compartments each capable of holding 8,000 lbs. of ore. Along the dividing ridge runs an iron shaft which is connected by chains with doors that swing outward from the end of each space. A large wheel at the end of the shaft enables one man, in a few minutes, to unload the entire car. On account of the extreme width of the cars, the Pennsylvania road refused to allow them east of Pittsburgh, but the orders were not issued until two had made the trip to Johnstown, Pa."

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Passes.—*All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.*

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

GOOD PRACTICE IN BRIDGE BUYING.

The peculiar advantage of presenting facts by a diagram—that it permits facts and relations to be grasped at once without effort which no amount of figures could as well or as forcibly convey—could have no better illustration than the diagram of the comparative weights of bridges presented in another column, which bridge-*buyers* especially can study with great profit.

We have taken some pains to collect together on one plate a variety of evidence as to the weight of bridges, sufficient to indicate at least what we believe to be unquestionable, that Mr. Pegram's formulæ, which constitute the basis of the diagram, will give the absolute weight of any span designed in accordance with modern American practice within a very small percentage, and the comparative effect of changes in specifications within a still smaller percentage, or practically exact. In preparing such formulæ Mr. Pegram has unquestionably rendered the railroad public, as well as the engineering profession, a great service, which, it is to be hoped, will be appreciated and utilized. No little labor, a large experience, and access to a goodly number of actual examples of bridges, were necessary to do this. Few of the engineers who are quite capable of designing single structures successfully would have been able to do the work as well, and fewer still would have had the inclination.

The salient facts of importance to bridge-buyers which are shown may be said to be three, mentioning them in inverse order to their novelty and importance:

1. The very small economy in building double-track bridges instead of two independent single-track spans.

2. The trifling and petty economy (from the buyer's stand-point) realized by sailing close to the wind in the matter of the specified rolling load.

3. Allied to the former—the unwisdom of specifying rolling loads in the manner now most usual.

The first of these is very clear from the succinct statement of Mr. Pegram, "for double-track bridges at 90 per cent." to the weight for single-track bridges. It is to be remembered in respect to this and every other detail evidenced by the diagram, that the cost of bridges does not by any means increase in direct ratio with their weight; but neglecting any difference in this respect for the moment, the weight of two single-track spans as compared with one double-track is as 200 to 190, or 5 per cent. in excess. There may be in addition a difference in cost of masonry abutments, but, on the other hand, the advantage of having two distinct spans, if only as a safeguard against accidents, is undoubted, and quite enough to make it well worth while to pay 5 per cent. more for the difference, all other things being equal, as they very frequently are. The only marked exceptions are (1) very long spans, where the added width is a convenience and tends to stability, and (2) very short spans, where the greater weight of a single double-track structure tends to check vibration and so increase durability.

Far more important than this is the evidence as to the very trivial economy realized by specifying light rolling loads. In fact, it would be difficult to exaggerate the importance of the moral which may be deduced from even a cursory study of the diagram, when it is remembered that from the first beginning of iron bridging until now there has been a gradual but unceasing increment in the maximum rolling load, which we have no reason to believe has ended yet. At this moment we could easily give a list of a dozen first-class roads, including every one of the trunk lines, which either have recently removed or are now removing or are contemplating removing large numbers of "old" iron bridges—few of them, however, over 20 years old—not because they are worn out, but because they are too light to be longer safe. That both the process and the cause for it will continue to go on, and that fully seven-eighths of the bridges now in use will be removed sooner or later, either for that reason and no other, or because their undue lightness has tended to create abnormal wear under the gradual increment of duty, cannot reasonably be doubted.

Under these circumstances one would naturally expect to find that the cost of discounting in advance these continual increments, by building a bridge so much stronger than was immediately necessary that it was not likely to be soon too weak, would be considerable; at least in full proportion to the increase in maximum load. That it is so is perhaps the common impression. On the contrary, we see by a glance at the diagram that the difference is comparatively trifling, and we may perhaps enforce the moral advantageously by a few definite figures, showing how petty is the economy:

	"Typical" Consolidation.	Consolidation.	Mogul.
For engines weighing (tons)	86.0	80.07	138.0
Or in the proportion of	100.	93.8	80.2
And for a load behind engine, per ft. of (lbs.)	3.000	2 240	1,820
Or in the proportion of	100.0	85 4	73.0
		P. c.	P. c.
Giving a loss per cent. in rolling load over the strongest type of bridge of	Engine,	6.2	19.9
	Cars,	14 6	27.0
The saving per cent. in *weight* (not cost) of bridge is only for spans of	30 ft.	1.26	2.27
	50 "	1 95	3.53
	80 "	2.90	5 44
	104 "	3.67	6.84
	1.0 "	5 02	9.25
	201½ ft.	6.00	11.39

Beyond these spans the comparative difference becomes greater, so that we have for the difference between a rolling load of the "typical" and ordinary Consolidation type (neglecting the Mogul type) the following:

		Iron	Steel.
For spans of	201½ ft.	6.66	
	320 "	8.89	10 45
	420 "	10.23	10 45
	516 "	11.79	10,45

Thus even the largest spans do not increase in weight as fast as they increase in capacity, and on the shorter and more common spans an increase of only 5 to 6 per cent. in weight gives 15 to 25 per cent. increase in carrying capacity.

But even that is not a fair presentation of the real question. Even if these figures were reversed, a bridge which was one per cent. over strong would cost only two or three per cent. more, whereas, if it ever becomes one per cent. under strong it will cost 100 per cent. more, from the fact that it must be speedily rebuilt. From this point of view—bearing in mind that the loss from a little extra strength is only the excess, whereas the loss from a little under strength is practically the whole structure—the folly of sailing close to the wind in the rolling load assumed is made so clear that it is amazing that it should be, as it is, the all but universal practice.

Again, the weight of a bridge is only one of the elements of its cost, and the cost does not by any means increase with the weight. Bridges, as railroads buy them, are usually for a lump sum, but as bridge manufacturers sell them, in their own private estimates, they are, of course, at a certain price per pound, which is far from fixed for all classes of structures, but may be said to be made up as follows:

	Cts. per lb.
1. Raw material, rolled and plate iron	2¼ to 3
2. Work on same in shop	⅝ to 1¼
3. Transportation by rail	⅛ to ⅛
4. Falseworks and erection	½ to 1
5. Profit and administration	⅛ to 1¼
Total	4 to 7

The lowest of these prices are sometimes cut under, especially in dull times and for large orders of a simple class of work. For example, a large contract for the Suburban Rapid Transit Co. has recently been let at 3.19 cents per pound, and much of the New York elevated work was taken at still lower figures, while on the other hand fat contracts at much higher rates are not uncommon, as on a recent and now well known contract for a great railroad bridge, where a profit several times greater than the largest above is said to have been realized; but these are fair averages for average work in moderately good and bad times.

It will be seen that only items 1 and 3 above, and not always even those, increase directly with the weight of the bridge. Shop and erecting work are increased of course by weight, but not by any means in direct proportion, and often very slightly by a moderate difference, while profit may be anything or nothing, according to the times and competition. Hence, we may say in a general way that 10 per cent. increase in weight with its far larger increase in safe rolling load, will mean not more than 5, or at most 6, per cent. in the cost of the bridge to the company, and proportionately for greater or less differences of weight.

No further proof is needed to show that common sense, reasonable foresight and due economy require an ample margin of strength in bridges, which is only another way of saying that an immediate and material reconstruction is needed of the specifications for rolling load which are now the rule on nearly all the roads which have any specifications, so far as we know, as well as in those put out by bridge companies and bridge engineers. How fast the world moves in this respect is evidenced by the drawings and details of the new "Class R" locomotives of the Pennsylvania Railroad, which already exceeds the limits of Mr. Pegram's "typical" Consolidation considerably, as is evident from the following comparison:

	Pennsylvania Class R.	Pegram Typical Consolidation.
Weight of drivers	102 850 lbs	96,000 lbs.
On a wheel base of	14 ft 10 in.	13½ ft.
Total weight of engine	116,550 lbs.	108,000 lbs.
On a wheel-base of	21½ ft.	21 ft.

Thus it will be seen that Mr. Pegram's "typical" Consolidation has already become typical of nothing, except the still increasing increase in the weight of engines; for who will undertake to say that the limits of this process have been reached even for the Consolidation type in the Pennsylvania Class R, which is not so heavy as many other engines of other types in use on other roads? If not, how absurd it is to build bridges which the changes of even a few years make too weak.

Again, and in its way still more important, the increase in maximum weight of cars has been greater even than in weight of engines, as is well evidenced by the rolling-loads used by Mr. Pegram, which were per running foot, for

Class M (Mogul)	1,820 lbs. per ft.	against	2,760 lbs.
" C (Consolidation)	2,240 " " "	"	3,118 "
" T (heavy ")	3,000 " " "	"	3 276 "

Cars loaded to exceed the latter limit, which only requires 45 tons within a length of 30 feet, are, even now, not so very rare, and are quite certain to become yearly more common. Since, then, the car load has become so nearly an equivalent to the engine load, and since even two engines, which are always assumed, cover over 100 ft., and it is frequently desirable to run more than two engines close together, what object is there in assuming a car load different from and lower than the engine load? The plain answer is that there is none at all and that a continuous rolling load of something like 3,300 lbs. per running foot will give none too heavy bridges, leaving probably no excess over occasional requirements for the transportation of ordnance and heavy machinery, with every probability that such will be the normal requirements of the near future, when low rates, train brakes and good couplings have had their natural effect on rolling stock, and with the certainty that the slight excess of weight will be worth its cost as tending to stability and durability and as a safeguard against shocks from derailed trains if it serves no other purpose.

In one respect only is such a specification defective, that it fails to make adequate provision for the concentration of load on one or more driving axles, which produces strains on certain parts, notably in the floor members, in excess of what any uniform rolling load provides for. This difficulty is easily overcome by assuming a single excess load in addition to the uniform rolling load, but the space which remains to us is too limited to discuss properly the question of rolling load specifications as they are and ought to be, and we must postpone it, adding instead a few words to illustrate how serious a danger is the underrating of the probable rolling load, and how persistently engineers give in to it:

In the *Transactions* of the American Society of Civil Engineers for June, 1886, Mr. Joseph M. Wilson, late Engineer of Bridges and Buildings for the Pennsylvania Railroad, gives a proposed new form of specification for that road which is one of the most elaborate in use, and certainly one of the most careful as respects rolling load. It specifies three different types of engines on which the strain sheet must be based, and two of these were explicitly "typical" engines, which it was not expected to exceed.

Yet in this very issue we illustrate an engine for the same line, adopted since the specifications were prepared, which considerably exceeds these limits, indicating that a chief defect in the specifications was in

sailing too close to the wind in this respect; but although 17 different engineers found considerably more than 17 different reasons to criticise the specifications, *not one* criticised them on this ground; and one engineer of deserved high standing (Mr. G. Bouscaren) explicitly states that "the live load adopted is not likely to be exceeded in the near future;" which was exceeded considerably within six months!

THE SILVER CREEK CATASTROPHE.

Unless the short remainder of the year should be unusually disastrous, this week has seen the worst catastrophe of the year, and in fact the worst since 1880, in which year two accidents of a very similar nature to that on Tuesday of this week occurred, with even greater loss of life—that at May's Landing, on the Philadelphia & Atlantic, Aug. 11, in which 28 were killed and 47 injured, and that near Pittsburgh, Oct. 9 in which 32 were killed and 17 injured. Since 1880 the only very notable collision which has occurred was that at Spuyten Duyvil, Jan. 13, 1882, in which 8 were killed and 16 injured.

In this week's accident at Silver Creek, on the "Nickel-Plate," there appear to have been 23 killed and 14 injured, or 37 in all, out of a total of about 40 in the car to which all the injuries were confined—the smoking car. The only accident of this year which is at all comparable to it in seriousness was that at West Deerfield, Mass., April 7, in which 10 were killed, 35 injured and three only escaped uninjured out of a total of 48 on the train, but that accident, as we noted in our issue of April 17, was the most fatal of any accident in the United States since Ashtabula, Dec. 29, 1876, which was in any way chargeable to mechanical defects of structure, or, we might probably have added, to defects of equipment. At least we cannot recall or discover any accident since 1876 in which defects of either structures or equipment caused so serious a result as that at West Deerfield, which would certainly be very gratifying and creditable, if there were not so many of a minor character to regret.

Accidents due to negligence in operation or direct disobedience of orders are at once more common and more fatal, and the accident at Silver Creek again illustrates that a frightfully large proportion of them happen to excursion trains. Both of the two accidents of 1880 mentioned above were likewise to excursion trains; and considering the very small proportion of such trains to regular passenger trains, and the frequency of accidents to them, it is probably quite safe to say that their chances of accident are from ten to twenty times as great as those to a regular train, and the chances of injury to a particular passenger perhaps greater.

The cause of the Silver Creek accident is as yet somewhat obscure, but the fact that the engineer of one of the train, ran away after the collision lends support to the apparent evidence that it was a case of direct disobedience or forgetfulness of orders. The train was a very heavy one, consisting of 14 fully-loaded cars. It was, as so often happens, "pulling around a curve" at about eight miles an hour just beyond the point to which it had orders, when it met a freight running at 30 miles an hour, with a clear right to the road, but hastening to make its meeting point—and the meeting point came just a little too soon.

Then came in the secondary cause for the accident. As is particularly apt to be the case with excursion trains, the rolling stock was somewhat miscellaneous. "The baggage car coupling was higher than the smoking car," with the natural result that it the latter furnished the point of least resistance when the collision came. The baggage car mounted at once over the platform of the smoker, and telescoped the latter at the level of the top of the seats, killing or maiming every one in it who did not have the good fortune to be thrown to the floor. The whole force of the collision was therefore expended on crushing the engines and these two cars. At the rear of the train "the shock was not felt much," nor was a single wheel derailed.

This result is singularly similar to that in another great collision, at Jackson, Mich., Oct. 10, 1879, in which 15 were killed and 29 injured, nearly all immigrants in a single forward car. The speed in that case also was not high, and the passenger cars better protected by baggage cars; but unhappily it availed nothing. The two engines remained together near the track. The following baggage and express car, instead of telescoping each other, mounted over the two engines and were not much smashed. The following smoker, which was nearly empty, butted hard against the engine and "rising from its trucks" telescoped the following heavily-loaded immigrant car in which most of the loss of life occurred. The next following car was not seriously injured, and many of the passengers in the following sleepers did not wake up.

That this should be so is not really so surprising, for, terrible as is telescoping for those who suffer thereby, a gentler way of stopping a train within a distance of two or three car-lengths could not well be than by the breakage in detail of the really light timbers of a car, after telescoping has once begun. It was noted at the Burlington brake tests by those who had been through collisions before, that the shock of the emergency stops was really far worse to the senses than even a collision, the reason being that although the shock was of course less, it was transmitted direct to the "sufferer," without any intermediate giving way of parts.

What might have happened in this latest collision had their been no inequality in draw-gear to provoke telescoping, it is of course impossible to say; but there is at least a reasonable chance that there would have been no telescoping. The shock throughout the train would have been far greater, some of the cars and perhaps half the train would have been derailed, and more general breakage and general bruising and alarm might have resulted, but the aggregate result would almost certainly have been less disastrous. That telescoping should be deliberately provoked by having passenger draw-gear at a different level at this late day, is something which ought not to be, and which it is to be hoped that this collision many tend to prevent.

It is easy to see why accidents due to gross negligence or forgetfulness should be so much more frequent with irregular trains. *Habit* is a great safeguard. The man who runs the same train at the same hour past the same meeting points every day in the year, gets the routine of his duties ground into him. If something exceptional comes up occasionally, that exceptional thing only is a real burden upon his attention. The rest of his duties, like reading and writing, come by nature, and he is therefore less likely to forget the single exceptional thing at the wrong time.

But to the crew of an extra train everything is exceptional and nothing is a matter of habit, and this difficulty is complicated by the fact that extras are an inferior class, and the natural tendency and the usual practice of dispatchers is to favor the regular trains, to the extent at least that the onus of avoiding disaster rests rather more on the special than on the regular.

To a certain extent this is natural and unavoidable, but we have continual practical evidence that the burden is dangerously in excess of the capacity for caution of the crews, and it is worthy of serious consideration whether something cannot and ought not to be done to favor them, at least in the practice of dispatches, if not in general orders.

NEW THROUGH LINES FROM THE WEST TO CHICAGO.

The reports are repeated that the Atchison, Topeka & Santa Fe intends to construct a line of its own from Kansas City to Chicago. Some time ago surveys were suspended on a proposed line in Illinois because, so it was said, the Atchison had bought the charter to make it part of a line to Chicago, and it seems probable that it is seriously considering such a project. It certainly ought not to be necessary for that company to build a line some 500 miles long through a country already very fully supplied with railroads in order to get work done with four or five railroads already in operation are entirely capable of doing. It is much to be feared that the multiplication of lines west of Chicago will result in serious trouble before long. These companies are now the most profitable group of lines in the country, counting by dividends, but they cannot bear indefinite multiplication without such a subdivision of the traffic of the country they serve as will reduce the profits of some of them materially. These railroads are in a country which has grown very fast, but their earnings do not increase except when they have made great additions to their mileage, and though several pay as large dividends now as ever, nearly all of them earned very much larger profits per share of stock a few years ago than they do now. The six great companies with systems extending westward from Chicago—the Milwaukee & St. Paul, the Chicago & Northwestern, the Chicago, Burlington & Quincy, the Chicago, Rock Island & Pacific, the Chicago & Alton and the Illinois Central—have had in the aggregate the following mileage, gross earnings and earnings per mile in each of the last six years:

Year.	Miles.	Gross earnings. Total.	Gross earnings. Per mile.
1880	12,145	$94,631,533	$7,792
1881	13,787	95,356,505	6,916
1882	14,962	99,178,612	6,629
1883	15,686	109,201,684	6,962
1884	16,332	105,563,684	6,462
1885	16,536	107,968,079	6,529

Now it was not to be expected nor desired—that is, by the public at large—that the profits of these railroads should continue exceptionally large, as they doubtless were in 1880; but the downward course has been so rapid that we may reasonably fear the acceleration to it likely to result from the construction of lines for the through traffic which must inevitably divert more or less local traffic from the old roads. These six great companies added 36 per cent. to their mileage from 1880 to 1885, and gained 14 per cent. in earnings, and in that time there were but two important additions to the competitors for the through traffic to and from Chicago—the Milwaukee & St. Paul's line to Council Bluffs and the Wabash. Since 1883, with an increase of 5½ per cent. in mileage, there has been a *decrease* of 2⅜ per cent. in earnings. Now we have three new lines opened between Chicago and St. Paul, and one, and possibly two (if the Atchison builds), to Kansas City. These will be, on a small scale, to the old lines much what the West Shore was to the New York Central, taking from them both through and local traffic. The diversion, it must be remembered, cannot be nearly so great as that with which the New York Central was threatened by the West Shore, because the through traffic on any route west of Chicago is very small in comparison with that between New York and Buffalo; it is already much divided, and the through lines themselves form comparatively a small part of the entire systems or the larger companies. The Milwaukee & St. Paul, for instance, is now working nearly 5,000 miles of railroad, and if its share of the St. Paul and Minneapolis business, which passes over 410 miles of its road, should be greatly reduced, it would not matter so much as if the through traffic passed over nearly two-thirds of its mileage, as in the case of the New York Central.

The same may be said of the local traffic, except that new lines between the Mississippi River, like the Illinois Central's new Chicago-Rockford line, or a large part of the proposed Atchison line, will pass through a country where the traffic is heavier, for an equal area, than the average for the Chicago systems. As, however, the railroads are there very close together, the limitation of the territory from which the new lines can draw traffic may offset the greater amount of traffic per square mile. In Illinois there is on the average a mile of railroad to six square miles of area, and when railroads are but six miles apart, a new one coming between them may not get as much traffic from a very populous and productive country as a line in a thinly peopled territory with no other railroad within 15 or 20 miles. This makes the prospects of success of any new through line very dubious, if it has to depend upon the traffic which the new road by itself can attract—such a line as the Minnesota & Northwestern, built through from Minneapolis to Chicago. This, however, is the only new line of the kind. The Chicago, Burlington & Northern comes nearest to it, but 120 miles of the line to Chicago and about 300 miles of the line to St. Louis, of which it will form part, are already in operation, and the new line is through a country where the railroads are not so crowded—but where local traffic is thinner also. The Atchison, Topeka & Santa Fe, if it builds an entirely new line, will have the difficulty respecting local traffic, but its great system west of the Missouri River will insure it a large through traffic. The Wisconsin Central has had to build but a little more road to bring its system to Chicago, and the Milwaukee & St. Paul's Kansas City line will require only about 200 to be built out of the 500 miles of its length from Chicago. Moreover, these new railroads will not be very costly though much more costly than the average of the new railroads built by the Chicago companies, because they will have to compete with the best railroads in the West, and cannot do so unless they can offer approximately equal service. But the addition to the interest charges of the old companies on account of the new lines will not be very great, except in the case of the Atchison, which would have to build about 500 miles of road, much of it over the somewhat difficult country of North Missouri, and secure an entrance into Chicago, which latter will require either a large expenditure of capital, or a large yearly rental for the use of some line already built. Therefore the building of these lines is not likely to have so great an effect as the construction of the two new lines to Buffalo had, though in one very important particular it may have even a greater effect—namely, on the rates. The through rates were already so low when the West Shore was built that it was not likely to have any permanent effect on them. There is (and ought to be) more margin between the cost and the average through rates west of Chicago, though this margin grows smaller and smaller as time passes, and from one of the most important traffic centres has been very

greatly reduced recently by the competition of Lake Superior, which will tend to reduce rates from places further south. Now the prosperity of the Chicago railroads depends on their getting higher rates than the railroads east and south of them. When their traffic has grown sufficiently they may be able to prosper with rates from Kansas City, Omaha and Minneapolis no higher per ton per mile than the rates from Chicago to New York over the trunk lines. The danger is that they may be compelled to make the trunk line rates before they have anything like the trunk-line traffic.

It sometimes seems strange that a great railroad system like the Atchison does not oftener build its own outlet, since it can control at once so large an amount of through traffic. But there have been many more cases of old lines pushing westward to new traffic centres than eastward to old ones. This is not so strange as it may seem at first sight, however. When the great bulk of the traffic of a system passes beyond its main terminus (for most railroad systems have a main terminus at one end and many termini at the other), then it does usually insist on having its own line as far as the great mass of traffic goes. The Pennsylvania would not rest until it had its own line to New York; and even the Baltimore & Ohio, whose traffic mostly stops short of that place, insists on going there. The Milwaukee & St. Paul would build from Milwaukee to Chicago, and the Wisconsin Central, with a very much smaller system, has followed it. But the immense Chicago systems do not even talk of having independent outlets to New York; and hitherto great systems west of Kansas City, Omaha and St. Paul have trusted to other roads to take their traffic to and from Chicago. It will be found, we think, that when the main terminus (on this side of the continent usually the eastern terminus) is itself a great distributing point, or a port whence the traffic is largely transferred from cars to vessel, the corporation has been content to remain there. The freight brought to Chicago, for instance, is distributed all over the country, and especially all over that part of the country north of the Ohio and the Potomac—the territory of the Eastern trunk lines and their immediate connections, though an immense quantity is carried through to the seaboard. Now if the Milwaukee & St. Paul or the Chicago, Burlington & Quincy had a line of its own from Chicago to New York—say the Michigan Central and the New York Central—it would still have to depend upon other trunk lines to reach the places to which a very large part of its traffic goes, and those other lines, receiving no through traffic from it, would prefer to take supplies for their local points from those roads which gave them a share of their through traffic, and especially would so far as they could give them the west-bound freight to competing points west of Chicago. Thus there would be much to lose as well as something to gain by controlling an outlet to the East. We call to mind but one instance where a company has had a great system on both sides of a great traffic centre—namely, the Wabash, at St. Louis, and it is not certain that this has been of advantage to it, or that the course of the traffic of the lines west of St. Louis has been much different from what it was when their terminus was at St. Louis. And St. Louis is not to the same extent as Chicago a great distributing market. The cotton and live stock are transferred there, and a great many hogs are packed there, but the grain to a great extent only passes through it.

But it remains a question what places are distributing centres to such an extent as to make them good railroad termini. Chicago and St. Louis have proved themselves to be such. Are Kansas City, Omaha, St. Paul and Minneapolis? As to the last two places (which must be counted as one terminus), there is little doubt that they are, though two great systems have lines on each side. The grinding of wheat at Minneapolis, and, more than that, the cheap transportation of Lake Superior, seem to have determined that a system with a terminus there *and on Lake Superior* will not find it necessary to control a line to Chicago. The fact that the Northwestern and the Milwaukee & St. Paul have lines west of St. Paul that may come into conflict with the Northern Pacific and the Manitoba makes it possible, however, that the last-named companies may some time think it best to go to Chicago.

Omaha is very much less of a distributing centre; the grain is not ground there, few hogs are packed there, it has no water outlet, and the cattle which rest in the stockyards are for the most part consigned through to Chicago. When the railroads east of Omaha had no lines west of the Missouri, the Union Pacific was probably better off than if it had a line of its own; now one company has a great system south of it, and another a parallel line about 600 miles long north of it, and a third is building lines in Nebraska. If the Union Pacific had been in a position where it could command capital, and its future was assured, it would very probably have had its own line to Chicago before this time, though it is dependent on its eastern connections to a much greater extent than the Northern Pacific or the Manitoba, because a much larger part of the traffic which it carries—the Denver and the Utah as well as the transcontinental traffic—is competitive, and if it had a line of its own to Chicago the other Chicago roads would doubtless exchange such of this traffic as they could command (which is most of the west-bound traffic) with the Union Pacific's competitors.

Kansas City is a great packing town and a great cattle market, and this makes it much more a distributing centre than Omaha is, and its new short line to Memphis tends to make it more so. A very large part of the traffic brought there, however, goes directly through without transfer, and the route of most of this could be controlled by the line on which the traffic arises. So far as the Atchison is concerned, moreover, it probably has much less through traffic than the Union Pacific that could be diverted from it to a competitor by its present eastern connections. By far the larger part of the freight which it receives from them goes to local points on its own lines, though it has been making a special effort of late to secure transcontinental traffic. It would therefore have less to lose by having a line of its own, though we do not feel sure that it would not lose as much as it would gain. Its position is being made more unsatisfactory by the lines which St. Louis and Chicago railroads are building into its territory, and it is conceivable that an outlet of its own may become indispensable to it.

If so it would be best if it should unite with one of the existing lines. The only one small enough for the purpose is the Chicago & Alton, and it has been proposed that the Atchison should purchase its stock as the Pennsylvania did the Philadelphia, Wilmington & Baltimore, issuing a collateral trust bond, having a very low rate of interest to obtain the purchase money. It would seem that it could better afford to pay a very high price for this stock than to build a line of its own, but it is not probable that it could get it for anything like the current quotations on the stock exchange. There is reason to believe that the large holders of Chicago & Alton stock have been sounded on this subject, but there are no signs that anything has come of it.

The Crops of 1886.

The crop report of the Department of Agriculture for September says that the spring wheat crop turned out considerably better than was expected in Wisconsin, Minnesota and Dakota, but not so well in Nebraska. The average for the whole country is reported at 84, against 80 reported Aug. 7, and the average yield is more than 11 bushels per acre and may reach 11½, which former would give 123,000,000 bushels. The winter wheat also has yielded better than was reported before threshing, probably about 12¼ bushels per acre on the average, or 309,000,000. The Department puts the yield of both at 80 or 90 millions more than last year, however, which is 437 to 447 millions. Though the gain over last year is nearly 25 per cent., the crop is nevertheless a small one, the production for seven years having been in millions of bushels:

1879.	1880.	1881.	1882.	1883.	1884.	1885.
459.5	498.5	380.3	504.2	421.0	512.8	357.0

The average of these seven years is 447½ millions. The wheat acreage, however, has not increased, but was smaller this year than in any other since 1879, and very little more than in that year.

The average condition of corn, reported at 81 Aug. 1, had fallen to 77 Sept. 1. The greatest of the corn states all have very light crops, the average condition being 72 in Illinois, 67 in Iowa, 62 in Missouri and Kansas, and 68 in Nebraska. This is a much more serious matter than the poorness of the spring wheat crop.

The corn acreage was much the largest ever known, and in these states covered several times as many acres as the wheat crop. Last year, when the yield was good, these five states produced 995 million bushels of corn, which was more than half the production of the whole United States, while they produced but 83 millions of wheat. This exaggerates the difference, however, for they had a wretched yield of wheat and a good yield of corn last year. The statement that they had 30,815,300 *acres* of corn against 8,272,000 of wheat tells the story better.

In Indiana and Ohio, which are also important corn states, the yield is good, and so it is in Kentucky. For the whole country a yield of 21 bushels per acre, or about 1,600 millions in all, is indicated, against 26½ bushels per acre and 1,936 millions in all last year. The decrease of 336 millions of bushels of corn in value is probably something like twice as great as the increase of 80 or 90 millions in wheat. We have had but two good yield of corn for six years, the yearly production having been, in millions of bushels:

1879.	1880.	1881.	1882.	1883.	1884.	1885.
1,755	1,717	1,194	1,617	1,551	1,795	1,936

The crop of 1884, to be sure, was 2 per cent. greater than that of 1879, but the acreage was nearly 12 per cent. greater, the corn acreage having increased every year but one, and being this year 2½ per cent. greater than last year and 21 per cent. more than in 1879. The yield per acre of 1879 would give 2,120 million bushels this year, and even the yield of last year would have given 1,984 millions.

This light corn crop must considerably affect the earnings of most of the railroads west of Chicago and St. Louis next year.

Oats have turned out pretty well, but not as well as was thought a month ago. The light corn crop makes them especially valuable. Barley is an average crop.

Cotton on the whole improved in August, in spite of a decided decline in Texas and Arkansas. The department says that the plant is vigorous, and with a favorable fall there may be an average crop, which would be, probably, less than to last year's.

The number of hogs for fattening is reported as 6 per cent. less than last year, which seems remarkable in view of the large corn crop last year, which encouraged hog-raising, but in view of the short corn crop it is not much to be regretted.

Thus this cannot be called a good year for crops. Taking everything together the production has been somewhat greater than in 1883, and very much greater than in 1881, but less than in any other year since 1878. This being so, it is difficult to see how the present large railroad earnings of Western roads at least can be long maintained.

Grain Shipments down the Mississippi.

A report of shipments of grain down the Mississippi by the barges is published as explaining why rail shipments of grain from St. Louis have been no larger this year. The barge shipments are reported to have been 5,993,652 for the eight months ending with August, and the Cleveland *Plaindealer*, commenting thereon, says the business is "two or three times that done during any previous six months," and that "with the possibilities now discovered the situation becomes more serious for the rail carriers."

So far are the river shipments from being two or three times as great this year as ever before, they are less than in 1883, and a great deal less than in 1881. For the last six years the total shipments of grain down the Mississippi for the eight months ending with August have been:

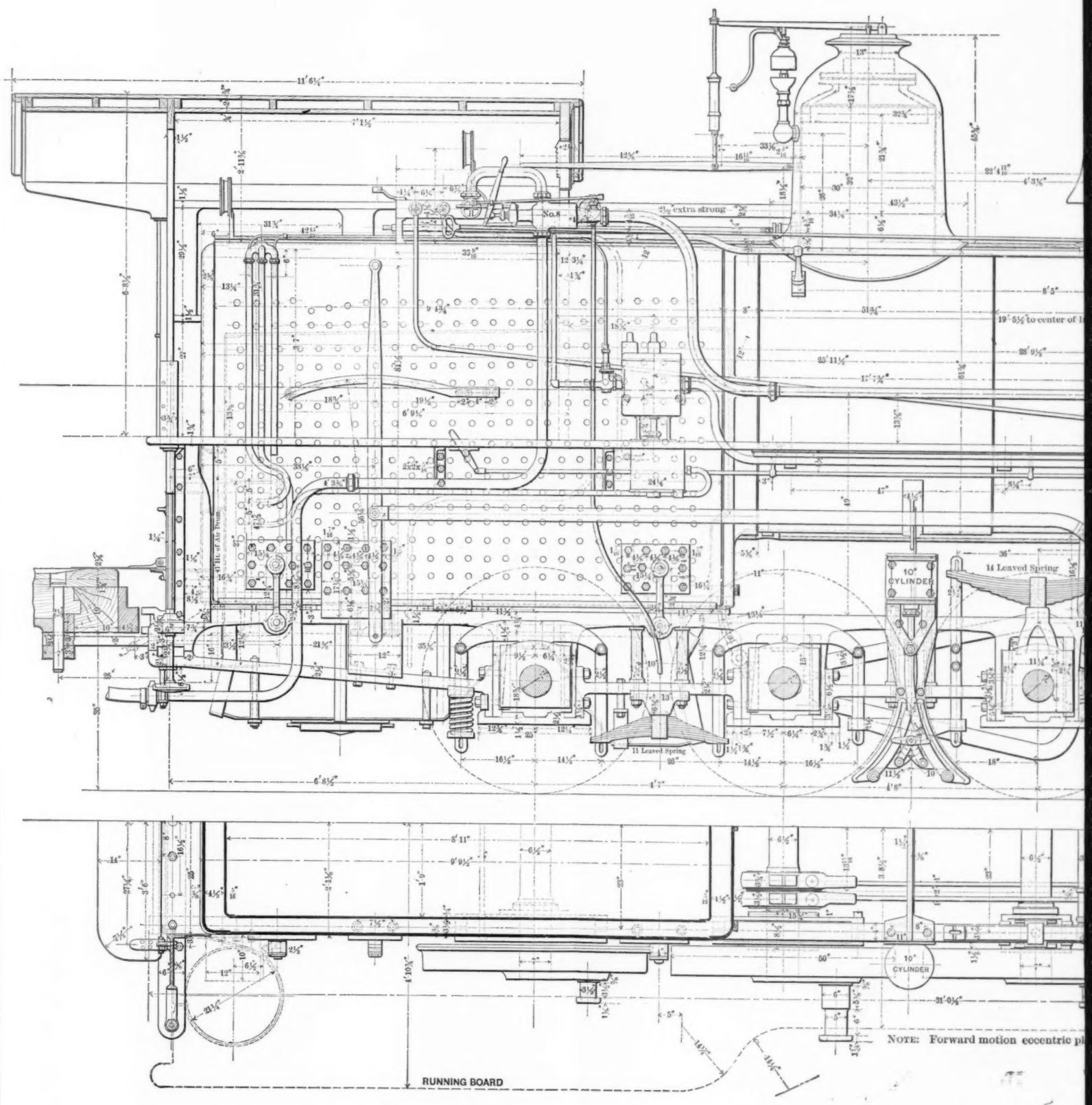
Year.	Bushels.	Year.	Bushels.
1881	9,859,713	1884	5,814,792
1882	4,871,594	1885	6,864,397
1883	7,775,100	1886	7,189,113

Meanwhile the total *receipts* at St. Louis were:

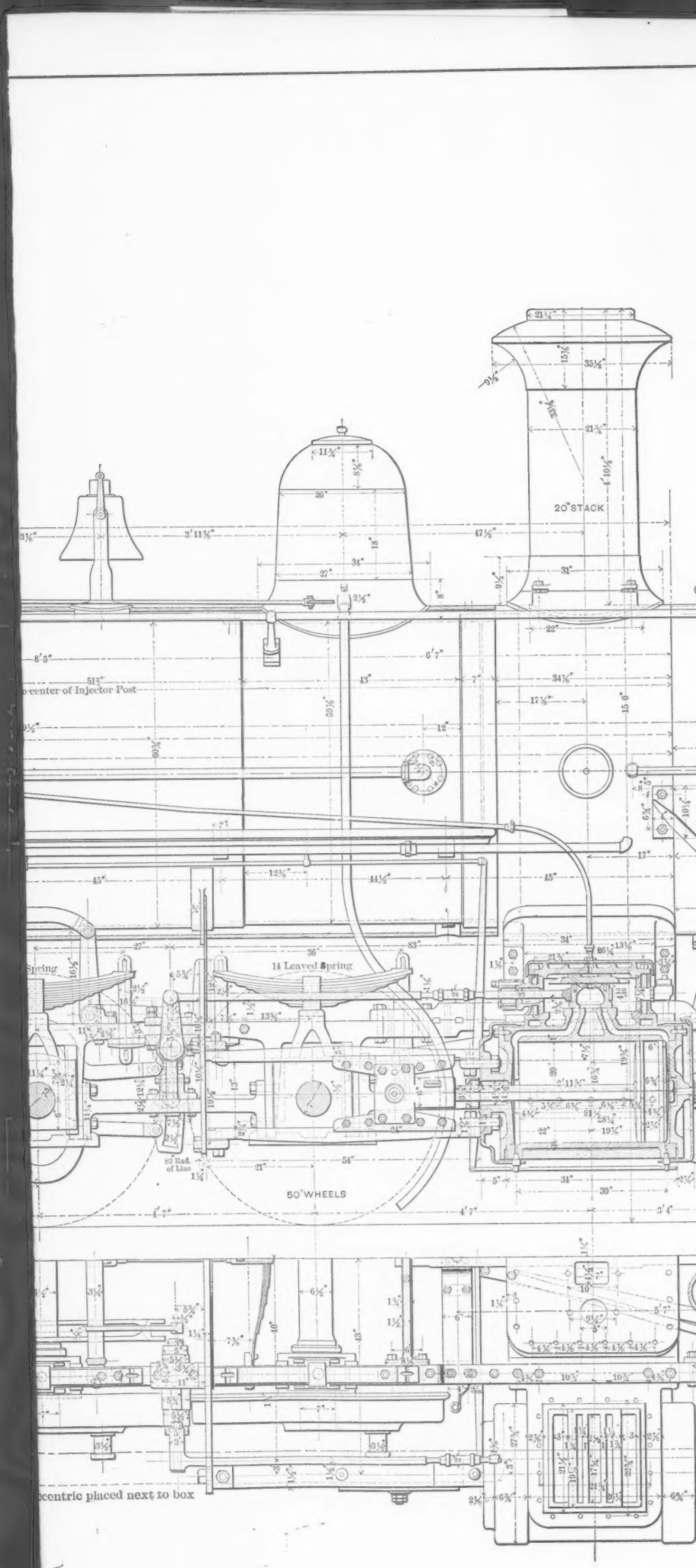
Year.	Bushels.	Year.	Bushels.
1881	28,755,745	1884	26,813,617
1882	27,913,871	1885	29,374,399
1883	28,523,061	1886	26,878,777

Of course a large amount of grain received at St. Louis is consumed there. A great deal of wheat is ground there, and very little of that goes down the river. The difference between the smallest (1882) river shipments and those of this year is 2,317,500 bushels. The river shipments last year, when the rail rates were lowest, being from 5 to 10 cents per 100 lbs. lower than this year for all but a few weeks, were 325,000 bushels less than this year. It is certainly true that when there is any grain to export, less will go down the river when rail rates to the East are very low than when they are higher. A 15-cent rail rate on grain tends to destroy river shipments as well as lake shipments, but it lacks much of doing either. With such a rate this year possibly the river shipments would have been 2,000,000 bushels less than they actually were; but the railroad would not have made anything on the traffic thus gained, and would have lost the profit they have made on what they actually did carry, so that they ought to be able to see 900,000 bushels a month go down the Mississippi with great equanimity.

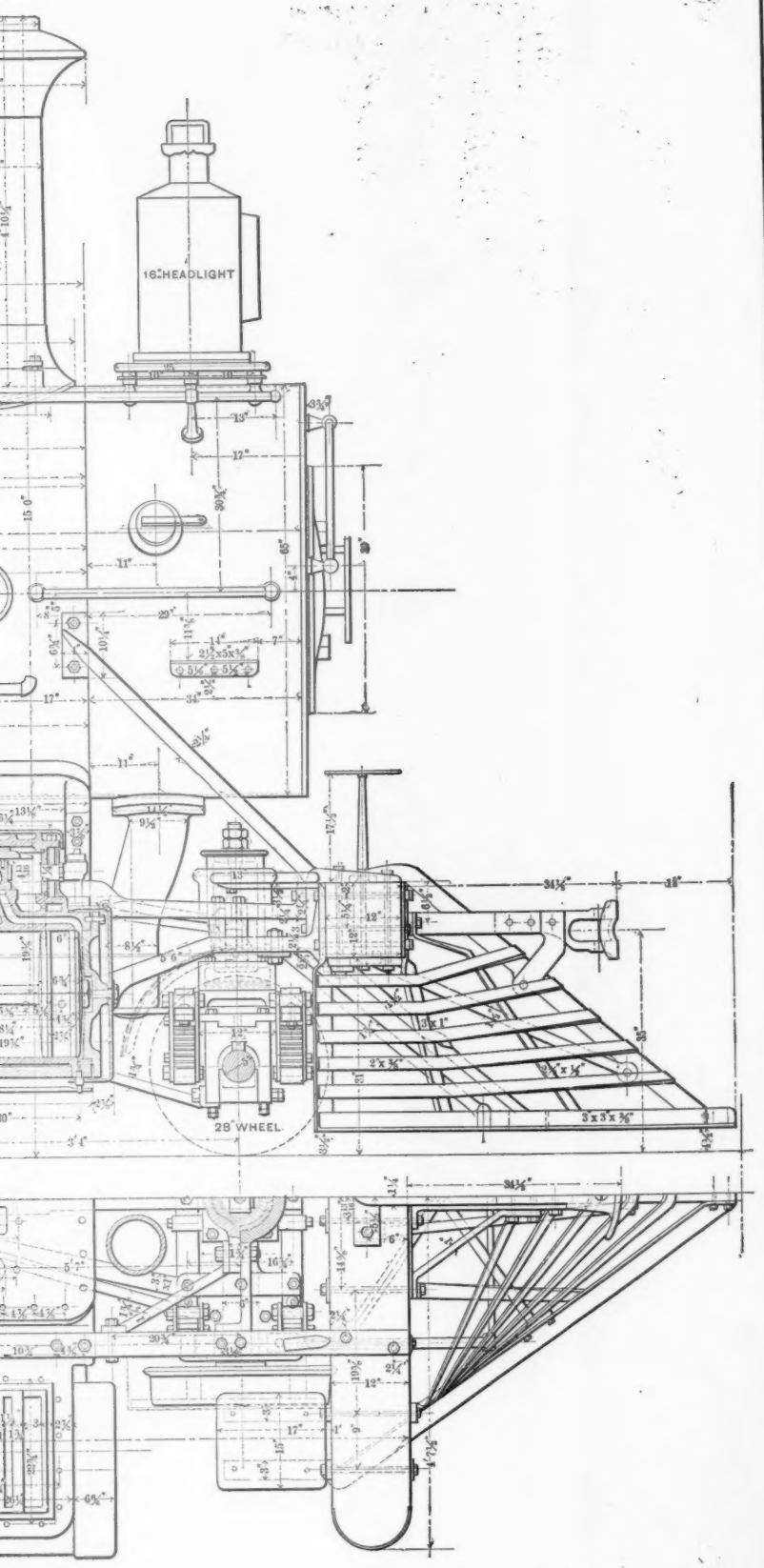
But the river shipments ceased to be large months ago, having been made chiefly while lake navigation was closed. During the five months ending with May they amounted to 5,430,476 bushels (1,086,095 per month); while for the last three months they have been only 1,758,637 bushels (586,212 per month.) This may be a considerable fraction of the St. Louis shipments, but it is an insignificant part of the total Northwestern shipments, for during these three months they have been 59,844,000 bushels, so that the river shipments were less than 3 per cent. of them. Just now they are favored as they have rarely been before



CONSOLIDATION LOCOMOTIVE. CLASS



CLASS R, PENNSYLVANIA RAILROAD.


16" HEADLIGHT
29" WHEEL
34½"
11"
3 x 1"
2 x ¾"
3 x 3 x ⅜"
2½ x 2½ x ¼"
2½ x 3 x ¾"

by high lake and canal rates, but they do not as yet show any tendency to increase.

The attempted blowing up of an interlocking signal tower at Chicago this week, and its actual serious injury, indicate that the employed as well as the employers, have detected in this new agency an important means of defence against the sudden annoyance and interruption of traffic which comes from strikes. The matter has not been much talked about in the papers, but the switchmen's strikes at Chicago, St. Louis and elsewhere, gave a very decided boom to the interlocking switch and signal business, which still continues. The assistance to be derived from such mechanism in case of a strike was very conspicuously illustrated at St. Louis, and contributed greatly to a settlement of the difficulties there. Almost immediately inquiries began to come in for further interlocking mechanism, and since the Chicago difficulties these inquiries have been more definite and more positive, until now the prospect is that more interlocking apparatus will be set up in the ensuing year than in any year before.

Experience in England makes it almost certain that this movement will continue with increasing impetus until it will be the rule and not the exception that every grade crossing, junction and yard of any importance whatever will be operated by interlocking apparatus. That it is greatly for the interest of all parties cannot be doubted. As a safeguard alone it is worth many times its cost at crossings and junctions, and although this is less important in yards, yet when the money saving as well is taken into account, the argument in favor of using interlocking at all such points, where any considerable traffic is to be handled, is vastly the stronger.

The companies which belonged to the Western Traffic Association, namely, those with lines between Chicago and St. Louis on the east, and Council Bluffs, Omaha and common points in Nebraska on the west, came to an agreement last Wednesday, after long-protracted negotiations, during which many difficulties were presented. So far as the discussions have become public, the chief difficulties regarded settlements under the old agreement, and the division of the range cattle business. The Wabash was much behind in the old pool, and was anxious that settlements should be made according to the old agreement down to the time the new one takes effect, though for months no attention had been paid to that agreement in maintaining rates, etc. The Chicago & Northwestern would not agree to a division of the range cattle, which it secures by its new line to Fort Fetterman, which reaches the heart of the cattle country. The Wabash gave way on the question of settlements, so far as to leave that for after consideration; and the range cattle question was settled by removing the boundary from the north-and-south line through Valentine, Brady Island and Indianola, about 260 miles west, to Laramie City and Douglass, the latter the terminus of the Northwestern's new line. The agreement is for five years, and is for a division of the gross earnings.

Most of the companies interested in the St. Paul and Minneapolis traffic are parties to this new Western agreement, and their success in this makes very probable similar success in reorganizing the Northwestern Association on the same basis.

That the day is near at hand when aluminium will play an important practical part in the arts is indicated by many concurrent signs just now, one of the greatest of which is that the largest dynamo in the world has been built for producing it, from designs of Mr. C. F. Brush, for the Cowles Electric Smelting and Aluminium Co., of Cleveland, O. It converts about 400 horse-power into electricity, running at 430 revolutions per minute. Large works have likewise been erected near Bremen for producing aluminium by an analogous yet somewhat different electrical process, and the scientific journals of the world are now full of the subject, and generally speak in a most hopeful way of the outlook.

It does not yet satisfactorily appear that the price can be reasonably expected to be brought so low as to very seriously modify the coarser metallic processes which deal with large masses of metal, but the peculiar property which aluminium possesses of adding vastly to the strength and durability of the more common metals when admixed with them in only a small proportion will greatly facilitate its introduction on a large scale should the price fall even moderately low, while its light weight, ductility, non-corrosive qualities, low melting point, great strength and ease of casting or melting will speedily bring it into wide use for the finer metallic arts should its price become reasonable. For engineering instruments, for example, it would be an almost ideal material, and save the wear on the shoulders of many a tyro in field-work. There is as yet, however, a plentiful lack of positive evidence as to what its price may fall to, but as the ore (common clay) is, next to silica, the most abundant of all materials and as power for producing the necessary strong electric current may be had at many points very cheaply, there certainly are interesting possibilities in the new processes. A bridge of aluminium, of any considerable span, would not need to weigh more than a fifth to a tenth or even a twentieth of an iron bridge of the same strength, so that a considerable price could be afforded for it, especially for making the alloys with larger quantities of iron and other metals which have properties closely resembling the pure metal.

The through shipments from New York over the trunk lines were, after all, not much affected by the new "cotton piece goods" rate which went into effect Aug. 27, the total shipments at that rate in the first four days having been but 187 tons, out of total shipments of about 17,000 tons. The shipments have increased in August from week to week, but not very fast, the average for the last ten days having been 3,480 tons per day, against 3,200 in the first 21 days.

For the whole month of August the New York shipments have been:

1880.	1881.	1882	1883.	1884.	1885.	1886.
92,042	120,886	115,862	96,991	101,040	106,447	101,988

The comparison is favorable to this year, for last year the rates were about 45 per cent., and in 1881 and 1882 about 30 per cent. lower than now, and last year at least very much more freight was diverted from the canal by these rates than the excess over this year's shipments. The shipments were nearly the same as in 1884, when rates were fairly maintained and there is nowhere any indication of the great growth in trade, compared with previous years, which has been hoped for. The gain over July, however, was much larger than in 1884 or 1885, the July and August shipments having been:

	1880	1882.	1883	1884.	1885.	1886.
July	78 193	79,464	81 959	92,222	102,397	86,738
August	92,042	115,862	96,991	101,040	106,447	101,988
+ in August.	13,849	36,398	15,032	8,818	4,050	15,250

In 1882 the July shipments were made very small by an advance in rates, made known early, which caused freight to be hurried forward in June and earlier that otherwise would not have been shipped till July.

For the eight months ending with August the New York shipments have been:

Year.	Tons.	Year.	Tons.
1880	680,247	1884	788,387
1881	730,423	1885	788,890
1882	1,015,893	1886	722,021
1883	688,460		

Thus the shipments this year have been a twelfth less than in 1885 or 1884, 29 per cent. less than in 1882, when the business was carried at extremely low rates for six of the eight months, but nearly as great as in 1881, when rates were pretty well maintained until into August, and greater than in 1882 or 1883.

Twenty-four railroads report their August earnings this week, all small roads except the New York Central, as may be known, since the 23 earned together:

	1886.	1885.	Increase.	P. c.
August earn	$2,918,284	$2,678,612	$239,672	9.0

The 38 reporting last week earned more than six times as much, and gained 15½ per cent.

Still, all the railroads reporting this week except five had an increase in earnings, the decreases being 2 per cent. by the Denver & Rio Grande Western, 4¼ by the Mobile & Ohio, 9¾ by the South Carolina Division of the Richmond & Danville, 16 by the Columbia & Greenville, and 11¼ by the St. Louis & Terre Haute Main Line. Few of the gains are very large, except that of the New York Central, the Cincinnati, Washington & Baltimore gaining 30½ per cent., the Gulf, Colorado & Santa Fe 18½, the Marquette & Ontonagon 20, the Memphis & Charleston 24, and the St. Louis, Arkansas & Texas 44 per cent. The New York Central's gain cannot be given correctly, because the report includes the West Shore's earnings this year but not last. As the West Shore earned but $1,101,931 in the *three* months ending with September last year, we may be sure that the earnings were not more than $450,000 in August, when traffic was much lighter than in September. This added to the New York Central's earnings reported for that month makes the comparison for the united roads:

	1886.	1885.	Increase.	P. c.
Earnings	$2,980,974	$2,400,194	$580,784	24.2

Including this, the earnings of the 62 railroads that have reported so far were, in August:

	1886.	1885.	Increase.	P. c.
Earnings	$24,222,746	$20,939,822	$3,282,524	15.7

which is a very large gain indeed.

The earnings reported for the first week of September nearly all show gains, but generally not quite so large as the August gains.

August Breadstuffs Exports—Great Growth of Baltimore Flour Exports.

The breadstuffs exports last August were very much larger than last year, but less than in any previous year recently, and not nearly so large as in some other years. For six years they have been:

	Flour, bbls.	Wheat, bu.	Corn, bu.	All grains and flour, bu.	Value.
1881	598,876	14,378,024	6,704,984	24,011,048	$25,547,521
1882	683,491	20,868,199	269,128	24,416,040	28,951,320
1883	697,674	9,950,588	5,736,627	19,399,951	18,816,129
1884	752,145	12,373,402	1,599,293	17,728,828	16,519 044
1885	565,613	3,187,668	3,019,000	7,025 895	7,709,950
1886	975,814	11,367,763	1,435,123	17,354,080	15,116,881

The total exports (bushels) were nearly 2½ times as great as last year, and the value twice as great; but both quantity and value were less than in 1884 and much less than in previous years, the quantity being 7,000,000 bushels and the value $13,800,000 less than in 1882. It is noticeable that the flour exports were very much larger than ever before in August. They made nearly 30 per cent. of the total export values. The flour and wheat shipments together were the largest since 1882, though they follow two successive light wheat harvests, testifying to the large accumulated surplus and the general conviction of holders that prices would not rise much.

Last August, the exports of wheat from Baltimore were very nearly as great as from New York, 27.1 per cent. of the total wheat exports going from each. This is not very remarkable when there has been a good winter wheat crop, but Baltimore also exported nearly as much flour as New York, which is very unusual indeed. In August, 22.8 per cent. of the flour exports went from Baltimore, 25.2 from Boston, and 29.6 from New York. Last year only 3⅛ per cent. of the August flour exports were from Baltimore, while 21¼ per cent. went from Boston and 40½ per cent. from New York. Last year Baltimore exported but half as much flour as Philadelphia; this year nearly seven times as much.

For the two months July and August the course of exports has been somewhat similar, the flour exports having been:

1886.	N. Y.	Boston.	Phila.	Balt.	U. S.
Barrels	562,775	456,765	59,950	491,038	1,952,781
P. c. of total	28.8	23.4	3.1	25.2	.....
1885:					
Barrels	452,188	257,135	75,784	81,466	1,162,233
P. c. of total	38.9	22.1	6 5	7.0	.....

Thus it is from New York that the grain of Baltimore has been chiefly obtained, Philadelphia having little to lose, and Boston having as large a share as last year.

It might be supposed that a good winter wheat crop would favor flour exports from Baltimore as it does wheat exports; but, in fact, in 1882, when the wheat exports were largest and when the flour exports of Baltimore in August were the largest they have been until this year, these flour exports were only 51,033 barrels, against 222,468 this year. This exceptional flour export movement from Baltimore began in April. In the first three months of this year it exported 178,031 barrels, which was 10¼ per cent. of the total exports. Since then in successive months the Baltimore exports have been:

	April.	May.	June.	July.	August.
Barrels	135,143	114.525	176.774	268.570	222,468
P. c. of total	19.2	13.0	21.7	27.5	22.8

It should be said, however, that there was in the first half of 1885 also a time when flour exports from Baltimore were unusually large. For the six months ending with June in that year, they were 787,431 barrels, and 14 per cent. of the total flour exports, being a much greater quantity, though a smaller proportion of the total exports, than in the first half of this year. But the summer exports from Baltimore have been several times as great this year as ever before, the occasion for which is not easy to discover.

The career of a high English railroad officer may be traced in a sketch of the life of Mr. J. P. Knight, General Manager of the London, Brighton & South Coast Railway, who died last July. He began his railroad career in 1842, at the age of 14, as junior clerk in the parcels office of the North Midland at Derby, afterward part of the Midland Railway. Three years later the person then Manager of the Midland, having been appointed Manager of the Brighton, took Knight (then 17) with him. In 1853, aged 25, he became Chief Clerk to the Superintendent of the Southeastern, and three years later was made "Out-door Superintendent" of that line, in which capacity he arranged for the interlocking systems at Cannon street and Charing Cross stations, which have not been altered since. In 1869 he became Traffic Manager of the Brighton, and very soon after was promoted to the position of General Manager, which he held for 17 years and till his death.

The pressure of the heavy grain movement is first visible in the rail shipments of the Northwestern markets in the week to Sept. 4, when they were 1,812,804 bushels, which, though much larger than before since harvest, has very often been exceeded at this season. Nearly two-thirds of these shipments were oats, but more of the wheat and corn, for which the vessels compete, was taken than for a long time previous, and the high lake rates are likely to drive more and more to the railroads.

The total grain receipts of the Northwestern markets for the week to Sept. 4 were 9,881,775 bushels, which is more than ever before in any year, though they were closely approached in the corresponding week of 1883. Wheat, corn and oats receipts were all very large—larger, as we have said, than in years when the crops to be marketed were much larger. It does not follow that the total grain movement from the Western farms was largest in this week. A very large amount has often gone through to the East by rail without going to or being reported at a Northwestern market, and a much larger amount than is going that way now. This is shown by the receipts at Atlantic ports, which

have frequently been immensely greater than they are now, and much greater than the receipts of the Northwestern markets.

Chicago had 54½ per cent. of these large receipts. Though it received comparatively little (16 per cent.) of the wheat, it had 86 per cent. of the corn and 63 per cent. of the oats. St. Louis, which came next, had but 11½ per cent. of the total receipts, and Duluth, which receives nothing but wheat, followed with 9¾ per cent.

The Minneapolis mills in the last two crop years to Aug. 31 produced flour as follows:

	1885-86.	1884-85.	Increase.	P.c.
Barrels..	5,936,530	5,221,243	715,287	13.7

The production last year required about 26,714,385 bushels of wheat, which was within 6,500,000 bushels of the total production of the state of Minnesota, and very nearly the same as the production of Dakota. Nowhere else in the world is there anything like this flour production in any one place. It was equal to 19,000 barrels every working day of the year, which would load 95 modern 20-ton cars, which would fill a track more than half a mile long. Yet the freight on this immense production through by rail to New York, would be only $3,860,000, and the freight on it to Lake Michigan less than $900,000 at current rates. Actually, a very large part of it—this season apparently much the larger part—has gone by rail only to Lake Superior, at 5 to 10 cents per barrel; but these shipments have been forwarded by rail from the Eastern lake ports. This, however, has been a season of unprecedentally low rates on this traffic for the lines west of the lakes. They may get better rates hereafter, but the indications are that they can never get the rates common heretofore, though most of the production while navigation is closed must be forwarded by rail, it not being practicable to store flour by the million of barrels, as wheat is stored, to wait for navigation to open.

The prospect of a light corn crop has not led the farmers to hold back their old corn, which is chiefly marketed, if at all, from about the opening of lake navigation until October. The receipts at the Northwestern markets were larger in the week to Sept. 5 than in any other of this year, and, with one exception, the largest since Sept., 1883, when a corner drew out all the corn that could get to market by the last day of the month. For the four weeks ending Sept. 5, the Northwestern corn receipts have been, in bushels, for four years:

1883.	1884.	1885.	1886.
12,883,450	9,505,304	9,548,288	10,887,865

Considering the crop, there ought to be very much more corn in the country this year than in any of the others. It was reported to have been 141 millions more than in 1884, 385 millions more than in 1883, and 319 millions more than in 1882; yet the receipts since December have been less this year than any of the other three, having been 82.8, 70.6, 75.9 and 70.4 millions successively. With satisfactory prices the movement may continue to be heavy.

In one of the accounts of the late collision at Silver Creek it is said that "the two trains came together with a united velocity of about 40 miles per hour." The same style of statement is very common in describing collisions. Is it, or is it not, correct in its implication that the united velocity is the important matter? Let us suppose two trains of equal weight coming together "with a united velocity of 60 miles per hour" in three different ways:

1. Each train moving at 30 miles per hour in opposite directions.

2. One train moving at 40 miles per hour and the other at 20.

3. One train moving at 60 miles per hour and the other standing still.

Will there be, or ought there to be, any difference in the violence of the collision in these three cases and in the consequences to each train respectively, and if so, what? The conundrum is not a very hard one, but it is perhaps one that a good many have not thought of.

The Cincinnati & Westwood Railroad Company is anxious to give up the ghost. It is a little suburban line in Cincinnati, has not paid interest on its $40,000 of bonds for nine years, and cannot earn enough to make necessary repairs, and now petitions a court to be dissolved. Meanwhile a little town has grown up at its terminus which can hardly exist without the railroad.

The three railroads of the Newport News & Mississippi Valley system which form the line from Newport News to Memphis, report extraordinary gains over last year in both gross and net earnings for July, the aggregates being:

	1886	1885.	Increase.	P. c.
Gross.	$648.772	$462.941	$178.831	38.0
Net	231.662	164,668	66.994	40.6

The earnings of these roads were extraordinarily small last year in July, but this year they were larger than ever before.

We are informed that the Chicago, Milwaukee & St. Paul Railway has closed a contract with the Railway Telegraph & Telephone Co., controlling the Edison, Gilliland and Smith patents for telegraphing to and from moving trains, for equipping practically its entire system of roads with that device. It has been on trial on the Council Bluffs Division for some time, and on the Chicago & Milwaukee Division a still longer time, and has given excellent satisfaction. It is said that the immediate actuating motive for taking this step is that it is a measure of economy for handling work trains and other low-class trains, the saving in time and convenience being very great. As fast as may be, other trains will likewise be equipped with the necessary apparatus.

It will be remembered that this system depends on induction between an aërial wire carried on poles in the usual manner and a train circuit passing through the roofs of the cars. A continuous musical note formed by electric waves following each other at the rate of 500 per second is kept passing over the wire, and, when this is broken by the key, forms dots and dashes in the usual manner, but with a sound which is said to be very much easier to learn to read, because a dash, for example, is a prolonged sound, whereas with the ordinary sounder it is only two taps, separated by a longer interval of time than for a dot. All telegraph operators will see that this tends to make learning to read by sound almost as easy as to read by sight on a tape in the old way.

Another system of this kind, the Phelps, has been on trial on the New Haven road for nearly two years, without failure to operate, we have been recently informed, for a single day, and likewise with entire satisfaction. In that system, which was illustrated in our issue of Feb. 20, 1885, an insulated wire is laid in a box along the middle of the track, and the induction circuit passes through a coil of wire in a long pipe under the car, but the essential principle is the same as in the Edison apparatus. The cost should apparently be somewhat more than by the Edison system, and the latter may or may not have still other advantages; but either one seems, from the evidence now available, to be a practical and useful device. It will certainly be a distinct advance if the day is at hand when telegraphic communication with trains is to be continuously maintained, and tend powerfully to safety of operation, if not likewise to economy.

Duluth, in the week to Sept. 5, received more wheat than any other Western market, nearly twice as much as Chicago, and nearly six times as much as Milwaukee. It is the week when usually its receipts fairly begin, but this year they began two weeks earlier. Receipts increased also at Chicago and Milwaukee, doubtless because the spring wheat is coming forward, while they fell off at Toledo and St. Louis, but they are still nearly as large at St. Louis as at Chicago. The three winter wheat markets, St. Louis, Toledo and Detroit, together have received:

-Week ending-					
July 31.	Aug. 7.	Aug. 14.	Aug. 21.	Aug. 28.	Sept. 4.
3,102,515	2,119,667	2,043,946	1,825,385	1,784,061	1,627,274

While the receipts at the three spring wheat markets, Duluth, Chicago and Milwaukee, have been:

-Week ending-					
July 31.	Aug. 7.	Aug. 14.	Aug. 21.	Aug. 28.	Sept. 4.
899,937	839,720	908,442	887,402	1,144,275	1,666 147

Until the third week of August the receipts of Chicago were larger than those of both the other places, and then they were probably chiefly winter wheat; but the spring wheat receipts doubtless have increased all the time. In the last week they equaled the receipts of the three winter wheat markets, and they are likely to continue to grow greater while the winter wheat receipts grow less.

Duluth equaled these receipts of week before last only once last year, and that was just as navigation closed. They were equaled but once in 1884, also in November. The present large receipts there must tell on the earnings of the Northern Pacific, the Manitoba, and very likely also on those of the St. Paul & Duluth and the St. Paul & Omaha.

If any may have wondered why the Pittsburgh, Fort Wayne & Chicago road, which formerly yielded a large profit over the rental to the lessee, last year caused a considerable loss, they may find a sufficient explanation in the fact that the profit per ton per mile was 0.14 cent last year against 0.40 cent in 1880, and this in spite of a reduction of expenses per ton per mile from 0.51 to 0.44 cent, the average receipt having fallen from 0.91 to 0.58 cent. And in passenger rates the decrease was similar, being from 2.16 to 1.56. It is true that 1885 was an exceptionally bad year for rates, especially passenger rates, which had not fallen like freight rates, but were actually higher (probably because of the much smaller immigrant travel) in 1884 than in 1880. The profit per passenger mile fell from 0.81 cent in 1884 to 0.47 in 1885 (42 per cent.); per ton mile, from 0.67 to 0.58 cent (13½ per cent.). The enormous freight traffic on this road yielded a profit of less than $1,360,000, when with the rate of profit of 1880 it would have yielded more than $3,800,000.

Lake rates did not keep up to the highest rates noted last week, 5½ cents a bushel for wheat and 5 for corn from Chicago to Buffalo, but are now 4⅜ and 4¼, corn having been carried for 4 one day last week. These are very good rates, however. Canal rates have risen to 6⅛ cents for wheat and 6 for corn.

The Indianapolis Joint Weighing Association weighed 3,940 car-loads of freight in the month of August, and found the freight in them to exceed on the average 2,568 lbs. per car, or 10,118,370 lbs. in all, in excess of the weights as billed by the shippers. The average actual load of the car-loads weighed was 32,876 lbs., which is probably twice as great as the average 15 years ago.

This is the average of loaded cars weighed for 12 different railroads, and the average on the road with lightest loads was 29,271 lbs., ranging from that to 36,346 lbs., on three roads the average being more than 35,000 lbs. As the increase from the recent maximum permissible load of 20,000 to 24,000 lbs. has been made with but little increase to the weight of cars, this alone goes far toward explaining the great reduction in the cost of transportation.

The shipments weighed just about one-twelfth more than the shippers' statement of the weights, and at 20 cents per 100 lbs. the excess discovered by weighing last August amounted to no less than $20,237. It is not necessary to suppose, however, that all this was an intended deception by the shippers. They probably for the most part ship without weighing, and in estimating take pains only not to have the weight too great. By this time they have probably learned that they will have to pay on the actual weight, however they have billed it. But when there was no weighing the temptation to underbid was of course much greater, and must have resulted in carrying great quantities of freight at less than cost.

The provision exports last August were in value slightly greater than in the corresponding month of last year. There was a great decrease (30 per cent.) in the exports of beef, but an increase of 82 per cent. in tallow; a decrease of 24 per cent. in butter, but an increase of 14 per cent. in cheese. The exports of pork products were nearly the same both years.

The cotton exports were 13 per cent. greater than last year, but their value only 4 per cent. greater; there was a decrease in petroleum and an increase in live cattle.

The values of breadstuffs, provisions, cattle, petroleum and cotton exported in August for three years have been:

1884.	1885	1886.
$33 944.059	$23,734,890	$30,837,218

The value this year is 30 per cent. more than last year, but 9 per cent. less than in 1884. The gain over last year is nearly all in breadstuffs.

NEW PUBLICATIONS.

The Civil Engineer's Field-Book: Designed for the Use of the Locating Engineer. By Edward Butts, C.E. New York: John Wiley & Sons.

The feature of this work which distinguishes it most noticeably from all other field-works is the long table of "actual tangents and arcs," which occupies 182 of the 269 pages of the work, giving the length of the curve and also the length of tangent or "apex distances" for each minute of arc from 0 to 90 degrees inclusive, for each even degree curve from 1 to 10 degrees inclusive; so that we can find at once from it that the length of a 6 degree curve 67 degrees 28 minutes long is 1,124.44 ft. and the apex distance of the curve 637.958 ft.

Those who have felt the need of having this information so elaborately worked out for them will probably find this just the kind of a table they need. We must confess it seems to us very much like tabular work gone to seed. A table of apex distances for a one-degree curve is now well known to be a desirable addition to a field-book and universally given, as also some other functions of a one-degree curve—as the long chord, middle ordinate and external secant—which Mr. Butts does not give; but what must be the mental condition of a "field engineer" who cannot convert 67° 28′ into 67.467° on the instant, and dividing it by 6, find 11.24 stations for the length of his curve almost as quickly, without requiring 90 pages of fine type *to give this information only?*

Similarly, after nine pages have been devoted to giving the apex distances of a one-degree curve, is it worth taking nine more pages to give the same figures divided by two for a two-degree curve, and nine more pages to give the same figures divided by three for a three-degree curve, and so on? There is, it is true, a fractional difference in results thus obtained, but this in no case amounts to enough to change the nearest foot, and it would be no great matter if it did occasionally.

There are in addition the usual tables of natural angular functions, including versed sines and external secants; a very good table of radii for each minute up to 20 degrees, some data in frogs which are correct enough, but which are presented unfortunately, and a series of 25 other problems, covering 22 pages, for general location purposes. No demonstrations are given, and fully half the space is occupied by full numerical working out of such problems as

$$\frac{141.313 \times 1.49944}{1060.427} = 0.19982 = \tan. 11° 18'.$$

Having now faithfully described the work, we are spared the necessity of further criticism. We presume that the tables will be found accurate, and every one can judge for himself whether the matter of the book is such as he requires.

Standard Specifications for Railroad and Canal Construction for the use of Contractors and Civil Engineers. Compiled by John A. Yates, C. E. Railway Age Publishing Co., Chicago.

A good book of specification forms has been for some time a desideratum, the only one now in print being that of Prof. L. M. Haupt, which while giving a variety of meritorious forms omits some important details and in other ways falls short of the requirements. This little volume is an improvement on Professor Haupt's in this, that it covers some of the details which he neglects, and there is at least one form for almost all the more common details of ordinary railroad construction. Buildings and rolling stock are not touched upon, nor are several of the larger specialties of railroad work, such as tunneling, bridging and signal work.

This might be borne without complaint, but a more serious criticism is that, although the specifications are said to have been "compiled," there is no attempt to make them of general application and utility by showing from what source they were compiled, or how various approved specifications differ from each other for local reasons or otherwise, as they do in very many of their details, as notably in masonry. The author has simply collected what he thought were the best forms, as indicated by his experience (for that seems to be the only ground for the label of "standard" which he has given them), and gives them without one word of comment, explanation or note of differences. This is an unpardonably bad way of slapping together books. It makes one feel that there ought to be a law to forbid the publication of books which purport to be "treatises" or to show "standard" practice, but bear no marks of even an effort to justify the title by good honest work in collecting facts. We notice several details of the specifications which are not by any means entitled to be called "standard" and which we should regard as de-

cidedly objectionable, but discussion of them would be treating the work too seriously, since it does not really pretend (or rather, only pretends) to be more, as respects railroad work, than one man's judgment. The canal specifications given are "adapted" from those in use on the New York State canals, and as they are the the fruit of half a century of experience may doubtless be fairly regarded as standard, except as the author has seen fit to "adapt" them. What changes he may have made in adapting them to his judgment does not appear.

The book has therefore just that value which would appertain to a pretty complete set of specifications prepared by the author for some actual work, and no more. This value is often considerable, and the convenience of having them in book form is added. "Standard" specifications they are not in any sense, nor likely to become such.

TRADE CATALOGUES.

Osborne System of Construction for Heating, Ventilating and Power Plants. E. F. Osborne, St. Paul, Minn.

This pamphlet describes a novel system of obtaining power and heat from the same boiler by combining the two uses of the steam in one continuous circuit, so that on leaving the boiler the steam passes through the engine or pump or both, then through a circuit of heating pipes, and then through a "hydro-thermaton" to the boiler, returning to the latter as water. The description partakes too much of that mysterious style which inventors are so apt to affect, apparently with the idea that it is more effective in commending their devices to the public, inventing a great number of new terms, and speaking as if something very new and strange in physics was revealed in their discovery. This gives an air of humbug to a description which is apt to repel intelligent men from a careful examination, but it should not be allowed to do so in this case, as the device seems to have been found to possess real merit for railroad shops and other buildings where both heating and power are needed, and its principle appears to be entirely rational.

The New Agreement of the Western Traffic Association.

The following is the substance of the agreement concluded last Wednesday at Chicago, the contract being for five years. The business to be divided is:

First—The gross revenue accruing to the several companies, parties to the agreement, from transportation east of the Missouri River of any and all freight to or from Council Bluffs, Papillon and Omaha locally.

Second—The gross revenue accruing to the Missouri Pacific on hogs and cattle product from Omaha, Papillon and Council Bluffs, locally to points on or east of the Mississ ppi River south of Carondelet, to New Orleans inclusive, reaching that river at points below Carondelet, and the gross revenue accruing to the Kansas City, St. Joseph & Council Bluffs Railroad on hogs and cattle product from Omaha, Papillon and Council Bluffs, locally to Kansas City, when destined to points beyond.

Third—The gross revenue from transportation east of the Missouri River of any and all freight to and from all points on the Union Pacific Railway east of and including Julesburg, that is not now or hereafter pooled between the Burlington & Missouri River Railroad and the Union Pacific Railroad, that is now and hereafter pooled between the Sioux City & Pacific and the Fremont, Elkhorn & Missouri Valley and Union Pacific Railway companies, and that now and hereafter pooled between the Burlington & Missouri Biver, Fremont, Elkhorn & Missouri Valley, Missouri Pacific and Union Pacific railways.

Fourth—The gross revenue for transportation east of the Missouri River on the business of junction points pooled west of the Missouri River between the Union Pacific and the Burlington & Missouri River Railroad companies, except that of Lincoln, Neb., which is specially provided for.

Fifth—The gross revenue for transportation east of the Missouri River on the business of junction points pooled west of the Missouri River between the Union Pacific and the Sioux City & Pacific and Fremont, Elkhorn & Missouri River Railroad, except that of Lincoln, Neb.

Sixth—The gross revenue from transportation east of the Missouri River on all freight to and from all points west of Julesburg on the Union Pacific Railway.

Seventh—The gross revenue from transportation east of the Missouri River on all freight to and from Lincoln, Neb.

Eighth—The gross revenue from transportation east of the Missouri River on all range cattle, "range cattle" being defined to mean all cattle shipped from, or west of, Laramie City, on the Union Pacific, and Douglas, on the Fremont, Elkhorn & Missouri Valley, including also any cattle from that territory fed in transit in Nebraska, to come on through rates. It is agreed not to permit range cattle to be fed in transit east of the Missouri River on through rates. It is also agreed that in all the pools the earnings upon limestone, cement, railroad ties, lumber of all kinds, lath, shingles, fence posts and telegraph poles are to be excluded. It being understood that the term stone shall not include marble, slate and tiling of any kind; also that a sub-pool shall be made on lime and cement and also upon ties and lumber and its products. There shall be exempted from the pools soft coal mined west of the eastern boundary of the state of Illinois, or a direct line drawn south thereof to the Gulf of Mexico.

The division of earnings was arranged as follows:

Omaha, Council Bluffs and Papillon local pool—Kansas City, St. Joseph & Council Bluffs, 6 per cent.; St. Paul & Omaha, 5 per cent.; Missouri Pacific, 10 per cent.; the remainder to be divided among the other parties as hereafter provided.

Union Pacific local—St. Paul & Omaha, 2 per cent., except revenue accruing from the transportation of live stock; Missouri Pacific, 5 per cent.; the remainder to be divided as follows: Chicago & Northwestern, 14 per cent.; Wabash, Milwaukee & St. Paul and Rock Island, jointly, 74 per cent., this joint percentage to be divided as the parties thereto may agree

Burlington & Missouri River and Union Pacific pool—St. Paul & Omaha, 2 per cent., except revenue from live stock; Missouri Pacific, 5 per cent., the remainder to be divided as follows: Chicago & Northwestern, 13 per cent.; Wabash, Milwaukee & St. Paul and Rock Island, jointly, 75 per cent.; the Burlington accepts in this pool such portions of the business as may be alloted to the Burlington & Missouri River and waives all claim to the agreed share of the business alloted to the Union Pacific.

Business pooled between the Sioux City & Pacific, Fremont, Elkhorn & Missouri Valley, St. Paul & Omaha and Union Pacific and Missouri Pacific, 5 per cent.; the remainder to be divided as follows: Burlington, 13 per cent.; Wabash, Milwaukee & St. Paul and Rock Island, jointly, 87 per cent.; the Chicago and Northwestern and Omaha roads accept in this pool such portion of the business as may be alloted to the Sioux City & Pacific and Fremont, Elkhorn & Missouri Valley, and waive all claims to the agreed share of the business alloted to the Union Pacific.

Business west of Julesburg—Missouri Pacific, 5 per cent.; St. Paul & Omaha, 2 per cent., except revenue accruing from live stock; the remainder to be divided as follows: Burlington, 20 per cent.; Northwestern, 20 per cent.; Wabash, Milwaukee & St. Paul and Rock Island, jointly, 60 per cent.

Lincoln pool—Percentages to be allotted.

TECHNICAL.

The Car Shops.

This week the Allston shops of the Boston & Albany turned out two new passenger cars, Nos. 242 and 243, having the Mann roof, about 6 in. of mineral wool under the floors, and with 36-in. Hartford steel-tired wheels.

The Cleveland, Columbus, Cincinnati & Indianapolis has asked for bids for supplying 600 new freight cars, and the contracts will probably be awarded in a few days.

Concrete for Station Platforms.

The Fitchburg Railroad is about to make platforms at several suburban stations of concrete instead of wood.

Furnaces in Blast.

The capacity of furnaces in blast, on the first day of successive months is reported by the *Iron Age* as follows, in tons:

	Anthracite.	Bituminous or coke.	Charcoal.	Total.
May 1	36,924	67,888	8,211	113,023
June 1	38,239	70,766	9,867	118,872
July 1	36,762	71,316	9,885	117,963
Aug. 1	36,941	68,852	9,725	115,418
Sept. 1	33,207	69,206	10,797	113,210

The *Iron Age* says that the fluctuations in the number of anthracite furnaces in blast have been due almost entirely to temporary blowing out for repairs, and that there is probably little change in those which purpose to continue to make iron. In coke and charcoal furnaces the changes are small.

Compressed Gas.

The Pintsch Lighting Company make the following report of equipment furnished up to Aug. 14, 1886, for car, locomotive and station lighting with the Pintsch compressed gas system:

Cars equipped	22,173
Locomotives equipped	900
Number of tanks used	33,355
" " regulators used	23,073
" " lamps used	71,200
" " compressors used	150
" " miles on which system is operated in Europe	35,000
No. of gas works erected for supplying Pintsch gas compressed for use in the cars, locomotives, etc	91
Of which 35 are located in Germany.	
" 19 " England.	
" 8 " France.	
" 2 " Holland.	
" 3 " Austria.	
" 11 " Russia.	
" 2 " Sweden.	
" 3 " Denmark.	
" 1 " Switzerland.	
" 4 " United States.	
" 2 " Japan.	

The Pintsch system of compressed gas is also being extensively introduced, principally in England at present, for buoy and beacon lighting, enough gas being stored in some instances to burn 300 days and nights without recharging.

In addition 27 gasworks for isolated (or local) lighting have been erected in various parts of the world.

Brotherhood of Locomotive Firemen.

The thirteenth annual convention of the Brotherhood of Locomotive Firemen opened Sept. 14, General Master E. P. Sargent presiding. Nearly 350 delegates attended. The report of Grand Secretary E. V. Debs reported that the order was in a prosperous condition, and that the accessions to membership during the year had been unusually numerous. The delegates will be hospitably entertained during their stay in Minneapolis, and at the conclusion of the convention will go on a trip to Yellowstone Park.

A Railroad-Tie Nursery.

Hon. R. W. Phipps, Forestry Commissioner for Ontario, has been for several months devoting his time to visiting the principal fruit-tree nurseries and estates where attention is given to arboriculture for timber and fuel. In a recent letter from Southern Kansas to the Toronto *Globe* he writes:

"One railroad board here, knowing that the growing of trees when set about in earnest is neither a slow nor difficult task, has established in Kansas the largest artificial plantation of forest trees in North America. These railroad gentlemen themselves gave out the contract for planting over a square mile of land with young saplings of the catalpa and ailantus, and their President, observing the success of their experiment, and impressed with its probable excellent financial results, has had planted at his own expense as a speculation as much more. These are situated near the little town of Farlington, Kan. These plantations, now bare of leaves, stretch far over the undulating prairie in full view of the town. The different sections have been planted, it appears, respectively, two, four and six years ago. About one-fourth is planted with the ailantus, the rest with the catalpa, and a few—perhaps 1,000 trees—of white ash. Those first planted are now about 25 ft. in height, the last about 12. Some of the taller are 7 in. through the stem. The first seedlings were brought from Illinois by the carload, the rest grown in seed beds here. There are in all about 3,000,000 of trees in full-growing vigor on these plantations, this calculation leaving out a few on some small portions of poor land which are not flourishing so well, but will be good trees in time. All were planted 4 ft. apart each way to shade the ground, but 8 ft. is the ultimate intention, which will allow three-fourths of the trees to be cut out, a thing which can well be done when they are fit for fence-posts, say 7 to 9 in. through, or, if required, they can stay even longer without injuring the plantation. When rather larger it is expected the trees will make excellent railroad ties, and at their fuller growth of 15 or 20 years they will supply very valuable timber for cabinet-work and house-building. Those who have only seen the original forest, with its trees growing at haphazard, here and there, little ones and big, have but a very vague idea of the large amount of wood the closely-planted groves can spare in their process of growth. This process, partly natural, is also by the art of the planter rendered partly mechanical. Extensive masses of young trees planted in this manner are restricted to but one method of advancement—the endeavor to throw out masses of leaves to the light and air of the upper surface. The lower branches, hidden in shade, rapidly die and fall to the ground, and the plantation becomes a multitude of long, straight stems, full of life and vigor, but only spreading into branch and foliage at the summit. If a tree in youth be crooked it straightens itself, if thus surrounded, as it advances in height. One acre so growing will give of wood, which is all the better taken, quite a number of cords yearly till all the superfluous trees are gone. On each acre here there are 2,000 more trees planted than will ultimately be allowed to attain full growth. There will be left perhaps 900,000 to come to maturity, and as these, as well as being very useful timber, are fast-growing trees, the profits seem likely to be very large."

New England Railroad Club.

The first meeting of the season was held in the Boston & Albany station, in Boston, on Thursday evening of last week. The subject for discussion at the October meeting will be, "The Interchange of Cars, including Inspection at Interchange Points."

British Iron Production.

The British Iron Trade Association reports the production in the first half of the year to have been as follows:

	1886.	1885.	Inc. or Dec.	P.c.
Pig iron	3,536 774	3,807,095	— 270.321	7.1
Open hearth steel	336,235	291,288	+ 47,947	16.5
Bessemer steel	713,337	623,772	+ 89,565	14.4
Steel rails	369,929	333,697	+ 36,232	10.9

The prospect is for a further reduction in the pig-iron production, but the steel production for the whole year is likely to be greater than last year.

Capacity of Blast Furnaces.

The furnaces which the American Iron & Steel Association places on the active list in the last edition of its *Directory* possess a very much higher average capacity, and are consequently of a very much higher average type, than those which were embraced in the same list in previous editions. Thus in the edition of two years ago, to go no further back, 675 furnaces were credited with a total annual capacity of 9,300,000 net tons, or an average of 13,777 tons each. In the present edition 578 furnaces are credited with a total annual capacity of 9,960,700 net tons, or 17,233 tons each. The furnaces which have been built in recent years are chiefly of large size and modern equipment, while those which are transferred to the abandoned list are chiefly of small size and antiquated equipment. The figures of total annual capacity are derived from individual returns of furnace owners and are based upon the assumption that it is possible for all the furnaces in the active list to be in blast for a whole year. As this condition is impossible under the most favorable circumstances, it follows that the actual aggregate capacity of the furnaces of the country is much less than the nominal capacity.—*Iron Age.*

The Proposed Messina Straits Tunnel.

There appears to be a great probability that the tunnel under the Straits of Messina, proposed as long ago as 1879, will be constructed, the Italian Minister of Public Works having instructed the engineer, Carlo Navone, to carry on investigations on the basis of the plans prepared by the engineer Gabelli. The latter brought the subject before the Italian parliament in 1879, and in 1882 he delivered a lecture at Rome, in which he pointed out how important it was to join the railways of Sicily and Southern Italy, both for commercial and military reasons, and demonstrated the practicability of the undertaking from an engineering point of view. According to Professor Seguenza, of Messina, a geologist, the formation of the strata under the straits is favorable to the construction of a tunnel. The cost of the latter is estimated by Gabelli at £2,840,000, and the time of construction at from 4½ to 6½ years. The tunnel would have to be made about 500 ft. below the level of the sea, this depth being reached by spiral approaches from the land ends. Its total length would be about 8½ miles. There is an alternative proposal for joining the island of Sicily with the Italian main-land by means of a bridge thrown across the Straits of Messina, which is about 8 miles wide at its narrowest part. Whichever scheme is adopted, there seems to be no doubt that the closer connection of the island with Italy is much wanted. Sicily has made great economical progress since its union with the Italian kingdom, its railways having now reached a length of over 500 miles, while the number of its population, according to the last census, is about three millions.—*Iron.*

Changes in Blast Furnaces.

The *Iron Age* makes the following notes from the lately issued *Directory* of the American Iron and Steel Association:

"All the furnaces in New England now use charcoal. The furnace at West Stockbridge, Mass., was the last to use anthracite, and it has been out of blast for several years. Vermont, which once had several active furnaces, has not had a furnace in blast since 1882. There is not now one charcoal furnace in New Jersey, where formerly there were many.

"The manufacture of pig iron with coke made in Central and Western Pennsylvania has made rapid progress in many eastern localities in late years. This fuel is now largely used as a mixture with anthracite in furnaces which formerly used anthracite exclusively. The use of raw coal in furnaces west of Pittsburgh is also rapidly giving away to coke.

"Carnegie Brothers & Co., limited, are now building two furnaces at their Edgar Thomson Works, which when completed will make seven in all. These seven furnaces will have a combined annual capacity of 450,000 net tons of pig-iron. Adding the capacity of the two Lucy furnaces to that of the Edgar Thomson furnaces, the whole nine furnaces being practically under one management, the total capacity of the nine furnaces is about 600,000 net tons per annum. This is the largest annual capacity of any furnaces under one management in this country. The next largest is that of the furnaces of the North Chicago Rolling Mill Co; at Chicago and Milwaukee, 432,000 net tons. The capacity of the Carnegie system is probably the largest furnace capacity under one management in the world.

"Notwithstanding the tendency of late years to build large furnaces—each of which will do the work of a dozen or a score of the old furnaces—there are still to be found running in Pennsylvania, Virginia and some other states small and old-fashioned cold-blast furnaces which make only 5 or 6 tons of pig iron daily. Speaking of Pennsylvania, there are yet remaining in that state of rich mineral fuel 24 charcoal furnaces. No two of these furnaces are under one management. Ohio still has 16 charcoal furnaces in the Hanging Rock region, but only one outside of that district.

"The Hanging Rock charcoal furnaces are generally banked up on Sunday, and blast is only stopped on this day in some of the bituminous furnaces of this district. There is also a charcoal furnace in Michigan which stops its blast on Sunday.

The great shrinkage in the number of blast furnaces in Kentucky certainly ought not to have happened. There are now only six furnaces in the state that do not belong in the abandoned list. We have transferred to this list in recent years 15 charcoal furnaces and one bituminous furnace. Not one new furnace has been built in Kentucky since 1881, and the two furnaces built in that year have been abandoned.

"Only two furnaces are now left in Indiana. In Michigan all the furnaces use charcoal except one, and it has not been in operation for years.

"The manufacture of coke pig iron is now general in most of the southern states which have a pig-iron industry. Only a few years ago these states made only charcoal pig

iron. The introduction of the use of coke in the southern states has most benefited the pig-iron industry of Virginia, Tennessee and Alabama.

"Philadelphia is usually referred to as a leading iron centre, and so it is if its immediate surroundings be considered, but it does not itself produce much iron or steel. Its iron and steel industries have made no headway whatever in the last 15 years. Nor does Cincinnati make any progress as an iron centre. It is not so prominent in this respect as it was in the palmy days of the Hanging Rock region. It is conspicuously lacking in a single steel plant of any description whatever. Upon the other hand, Pittsburgh and Chicago are making rapid progress in producing iron and steel, and to-day they are the great iron and steel cities of the country. Cleveland and Wheeling more than hold their own as producers of iron and steel, and San Francisco is also making steady progress, but Milwaukee, Detroit, St. Louis, Boston and Baltimore are not so active as they have been, while Buffalo, once active, has almost ceased to be regarded as an iron city. This list embraces all of our large cities which have been prominent in the manufacture of iron or steel. New York city never attained any prominence in this direction."

THE SCRAP HEAP.

A Runaway Train.

A dispatch from Millville, N. J., Sept. 6, says: "The crew of a local train, which leaves here for Camden at 7 a. m., were taking breakfast this morning, having left the locomotive and cars standing on the main track. From some unknown cause the throttle of the locomotive shifted and the train started off full tilt. The railroad men around the depot made every effort to board it, but failed. A telegram was sent to Vineland to stop it, but it was received too late. The steam finally gave out when the engine reached North Vineland and stopped of its own accord. A small boy living near the station took in the situation, and had the prudence to climb in the cab and blow the whistle and ring the bell to warn an approaching train, and thus saved a disastrous accident. The Cape May express hitched on the runaway and carried it back to Millville."

An Obliging Railroad.

A woman with a pet dog boarded a Naugatuck train at Waterville one day last week, and while the conductor and brakeman were trying to make her understand that the animal must ride in the baggage car, the animal skipped down the track. The lady gave chase, and the train was delayed some minutes in waiting until she could capture and bring back the runaway. The dog was not mad, but Conductor Beers was.—*Ansonia (Conn.) Sentinel.*

He Had Hunted Woodchucks.

When the Lake Shore switchmen first went out, the company brought into Chicago all the grangers they could pick up along the line and set them to work. Among them was an old fellow who did not look or act as if he had ever seen a railroad before, and appeared more like a backwoodsman from way up the woods than anything else. The engineers and firemen did not like the idea of making up trains with green men, and "scabs" at that, and so one afternoon an engineer says to his fireman:

"When we make up No. 17 I will pull back and get a good run on him and we'll mash that old cuss just to make an example of him."

The fireman nodded assent, and they both laughed at the thought of what a good joke they were going to have on the old man. They got several cars started back, and then, as the old codger went in to make the coupling, the engineer put on steam and came up with a rush and a bang that was heard all over the yards. Then the engineer told the fireman to jump down and run back and see how badly the old man was mashed. Just as the fireman got back the granger came out from between the cars looking as cool as a watermelon on ice.

"Thunder and lightning!" exclaimed the fireman; "did you make that coupling?"

"You bet your boots I did," replied the old man; "I've hunted woodchucks too long to be fooled on findin' a hole like that."—*Chicago Herald.*

Employes Thank Cornelius Vanderbilt.

The employés of the several railroads forming the New York Central system met on the evening of Sept. 14 in Mr. Cornelius Vanderbilt's office, at the Grand Central Station, and presented him with a set of handsomely engrossed resolutions, thanking him for the interest he has shown in their welfare by providing for them the new building which is to be erected on the corner of Forty-fifth street and Madison avenue, to be known as the Railroad Men's Building. The cost of the testimonial was contributed to by every one, from the President to the humblest employé, and the subscriptions were limited to ten cents each. The presentation was made was made by G. A. Warburton, representing the committee.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Chicago & Eastern Illinois, annual meeting, at the office in Chicago, Oct. 5, at noon.

Louisville & Nashville, annual meeting, at the office in Louisville, Ky., Oct. 6, at noon.

Ohio & Mississippi, annual meeting, at the office in Cincinnati, Oct. 14. Transfer books close Sept. 18.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Lehigh Valley, 1 per cent., quarterly, payable Oct. 15, to stockholders registered Sept. 20. Transfer-books close Oct. 1.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *National Association of General Passenger & Ticket Agents* will hold its next meeting at the Hotel Brunswick in New York on Tuesday, Sept. 21.

The *General Time Convention* will hold its fall meeting in New York, on Wednesday, Oct. 18.

The *Western Society of Engineers* holds regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m. on the first Tuesday of each month.

Master Car-Painters' Association.

The seventeenth annual convention was held in Chicago, Sept. 9 and 10, last week, President Fred. S. Ball (Pennsylvania Railroad) in the chair, and Robert McKeon (New York, Pennsylvania & Ohio, Kent, Ohio) secretary. The following members were present:

Wm. Sharp, Lake Shore & Michigan Southern, Adrian, Mich.

Robt. McKeon, New York, Pennsylvania & Ohio, Kent, O.

John Rattenbury, Chicago, Rock Island & Pacific, Chicago, Ill.

J. C. Stout, Union Pacific, Kansas City, Mo.

M. W. Stines, Barney & Smith Manufacturing Co., Dayton, O.

John H. Will, New York Cent. & Hudson River, West Albany.

Jos. Murphy, Louisville & Nashville, Louisville, Ky.

H. M. Billings, Pittsburgh, Cincinnati & St. Louis, Columbus, O.

Geo. O. Weidner, Lake Shore & Michigan Southern, Buffalo, N. Y.

B. F. Harris, Cleveland, Akron & Columbus, Mt. Vernon, O.

A. P. Sweet, Detroit, Lansing & Northern, Ionia, Mich.

Samuel Brown, Old Colony, Boston, Mass.

E. F. Joslyn, Lehigh Valley, Delano, Pa.

E. L. Fetting, New York & New England, Norwood, Mass.

James M. Brady, Rome, Watertown & Ogdensburg, Oswego, New York.

E. J. Aubry, Chicago & West Michigan, Muskegon, Mich.

A. J. Bishop, Cleveland, Columbus, Cincinnati & Indianapolis, Delaware, O.

F. S. Ball, Pennsylvania Railroad, Altoona, Pa.

W. J. Russell, Grand Rapids & Indiana, Grand Rapids, Mich.

Geo. H. Rattenbury, Cresson Car Works, Coburg, Ont.

E. L. Bigelow, Baltimore & Ohio, Baltimore, Md.

M. L. Sims, East Tennessee, Virginia & Georgia, Atlanta, Ga.

John A. Pulz, Wisconsin Central, Stevens Point, Wis.

H. W. Walton, Providence & Worcester, Valley Falls, R. I.

Geo. W. Lord, Fitchburg, Fitchburg, Mass.

Wm. Hibbard, Boston & Albany, Allston, Mass.

W. T. Ledford, Richmond & Danville, Manchester, Va.

C. C. Wood, Geneva, Ithaca & Sayre, Sayre, Pa.

R. W. Scott, Canadian Pacific, Montreal, Que.

Alex Campbell, Manhattan Elevated, New York.

John T. Cockburn, Chicago, St. Louis & Pittsburgh, Logansport, Ind.

D. Herbage, Flint & Pere Marquette, East Saginaw, Mich.

S. E. Kirkpatrick, Pullman Palace Car Co., St. Louis, Mo.

Wm. Lewis, Grand Trunk, London, Ont.

Frank M. Weidner, New York, Lake Erie & Western, Buffalo.

The following became members of the Association at this convention:

C. C. Young, Chicago, Rock Island & Pacific, Trenton, Mo.

Jacob Hoesly, Pennsylvania Railroad, Newark, N. J.

A. J. Moriarty, Baltimore & Ohio, Newark, O.

Thos. E. Coins, Chicago West Division (street) Railroad Co., Chicago.

E. A. Cole, New York, Chicago & St. Louis, Chicago.

T. Laughren, Milwaukee, Lake Shore & West., Kaukauna, Wis.

W. H. Martindale, Lehigh Valley, Ithaca, N. Y.

Henry L. Libby, Charles River Railroad, Boston, Mass.

A. E. Barker, Chicago & Northwestern, Austin, Ill.

A. C. Sensenbach, Pensacola & Atlantic, Pensacola, Fla.

L. W. Smith, Cleveland & Pittsburgh, Wellsville, O.

Fred. Johnson, Chicago, Burlington & Quincy, West Burlington, Ia.

J. D. Wright, Chicago, Rock Island & Pacific, Keokuk, Ia.

Byron Stansbury, Union Pacific, Omaha, Neb.

J. B. Miller, Lake Shore & Michigan Southern, Norwalk, O.

The Treasurer reported $262.25 in the treasury, against $377.61 the year before, the income having been $12 from initiation fees and $111 from annual dues, and the disbursements $288.36.

Amendments to the by-laws providing for standing committees were adopted, and members of the committees appointed as follows:

Committee of Information.—To answer questions proposed by members between conventions: E. A. Barker, Wm. Sharp, Robert McKeon, John Rattenbury, J. C. Stout, M. W. Stines.

Advisory Committee.—To prepare topics for discussion at conventions: Fred. S. Ball, J. H. Will, Joseph Murphy, G. O. Weidner.

Committee on Tests and Practical Experiments.—To formulate rules for making tests and to make reports on the results of tests: E. L. Fetting, H. M. Billings, A. N. Bradley, B. F. Harris.

A paper by M. W. Stines, of the Barney & Smith Co., Dayton, O., on "What remedies can we employ to prevent cracking of painted and varnished surfaces," and also one on the same subject by Wm. Davis, of the Canada Southern Railway, were read and discussed by J. H. Will, Geo. Weidner, Robert McKeon, J. C. Stout, and M. W. Stines.

On the second subject—"Are passenger cars now receiving proper care; what change, if any, can be recommended to lengthen the durability of our painting?"—papers were read by James Murphy (Louisville & Nashville) and A. J. Bishop (Cleveland, Columbus, Cincinnati & Indianapolis), and discussed by Messrs. Rattenbury, Stout and Barker.

The third subject was the discussion of the resolution "That flat surfaces and flat colors are preferable to glossy ones for interior decoration and finish." E. L. Fetting (New York & New England) had been appointed to take the lead in the affirmative, and J. C. Stout (Union Pacific) in the negative; but it turned out that Mr. Stout also was in favor of the affirmative, and Mr. Fetting's argument on that side was all that was brought out on the subject.

The fourth subject, on improvements in methods and materials, was passed, the members appointed to discuss not being present.

"When paint on baggage, mail and express cars becomes badly cracked, it is more economical to burn off the paint than to put on new sheathing" was the fifth question. Mr. Robert McKeon (New York, Pennsylvania & Ohio), read a paper in which he took the affirmative, which was discussed by Messrs. Rattenbury, Forstall, Stines, Putz, Ledford, Stout, Billings, Fetting, and the author, after which a resolution in favor of burning off was unanimously carried. The other questions discussed regarded the size of nail holes and the quality of painting materials received during the past year.

ELECTIONS AND APPOINTMENTS.

Adirondack Railroad.—At the yearly meeting, Sept. 9, the following directors were elected: William W. Durant, Saratoga Springs, N. Y.; George T. M. Davis, William Sutphen, New York; John L. Barbour, Saratoga Springs, N. Y.; John T. Banker, Cranford, N. J.; Cornelius E. Durkee, Saratoga Springs, N. Y.; George Leavitt, Chester, N. Y.; Frank H. Stott, Arthur C. Stott, William Hay Bockes, Thomas Williams, Edward L. Molineux and Jarvis S. Baker.

Canada Atlantic.—E. J. Chamberlain is Superintendent of this just completed railroad, which extends from Chaudiere Falls, near Ottawa, Ont., just by south to St. Albans, Vt., 188 miles.

Canadian Pacific.—C. E. McPherson is appointed General Traveling Agent, Passenger Department, with offices at Montreal.

Chicago, Burlington & Northern.—H. T. Keenan has been appointed Live-Stock Agent of the Chicago, Burlington & Northern. For many years he held that position on the Chicago, Burlington & Quincy.

P. Y. Griggs is appointed contracting Freight Agent at Chicago, and Geo. H. Schulte General Agent of the freight department at Minneapolis.

Chicago, St. Paul & Kansas City.—Mr. Geo. C. McMichael, General Manager, announces the appointment of H. Fernstrom as Chief Engineer in charge of surveys and construction, with office at St. Paul.

Connecticut & Passumpsic Rivers.—At the annual meeting in Newport, Vt., Sept. 8, the following were chosen directors. Emmons Raymond, Cambridge; W. K. Blodgett, Amos Barnes, Boston; Alden Speare, Newton, Mass.; Wm. D. Bishop, Bridgeport, Ct.; A. B. Harris, Springfield, Mass.; Fred. Billings, Woodstock, Vt.; S. I. Thompson, Lyndonville, Vt.; Oscar Edwards, Northampton, Mass. The only new director is Mr. Bishop. A. B. Harris was chosen President, in place of Emmons Raymond, who declined re-election on account of his great age and other cares; N. P. Lovering was chosen Treasurer, and H. C. Cleveland Secretary.

East Tennessee, Virginia & Georgia.—Under date of Sept. 6, General Manager C. H. Hudson announces that Mr. D. W. Lum is appointed Assistant Engineer, with headquarters at Knoxville, Tenn. He will act under the direction of the General Manager in matters connected with maintenance of way, will have direction of construction and improvement work, and perform such other duties as may be assigned him.

Evansville & Indiana.—The first directors are D. J. Mackey, Wm. Heilman, W. D. Ewing, G. J. Grammar, W. G. Lewis, E. B. Morgan and Edwin Taylor.

Helena, Boulder Valley & Platte.—Sept. 9 the incorporators elected S. E. Hauser, President; A. M. Holter, Vice-President; H. M. Parcher, Treasurer; Henry Barbour, Secretary; Adna Anderson, Chief Engineer.

Jacobs Creek & Mt. Pleasant.—The directors of this new company are W. C. Quincy, James M. Bailey, John G. Robinson, James A. Reed, James I. Bennett, David Hostetter and Mark W. Watson, most of whom are old directors of the Youghiogheny Co., or the Pittsburgh & Lake Erie.

Kansas City, Memphis & Birmingham.—G. H. Nettleton last week was appointed Superintendent of this road, which when completed will form an extension of the Kansas City & Memphis road.

Master Car-Painters' Association.—At the seventeenth annual convention in Chicago last week the following officers were elected for the ensuing year: President, J. C. Stout, Union Pacific Railway, Kansas City, Mo.; Vice-President, E. L. Bigelow, Baltimore & Ohio, Baltimore, Md.; Second Vice-President, Joseph Murphy, Louisville & Nashville, Louisville, Ky.; Secretary and Treasurer, Robt. McKeon, New York, Pennsylvania & Ohio, Kent, Ohio.

St. Joseph & Grand Island.—In New York, Sept. 10, the directors chose James H. Benedict, President; Sidney Dillon, Vice-President; Henry McFarland, Treasurer; Alexander Millar, Secretary, and Charles Francis Adams, Jr., Chairman of the board. The only change is the choice of Mr. Dillon as Vice-President in place of Elisha Atkins, who declined re-election.

PERSONAL.

—President Depew, of the New York Central, will probably arrive from Europe next week.

—President Garrett, of the Baltimore & Ohio, is expected from Europe by the end of next week.

—Samuel Sloan, President of the Delaware, Lackawanna & Western, sailed for Europe Sept. 11.

—Geo. H. Colby, Master Mechanic of the Boston & Albany Railroad, committed suicide in Boston, Sept. 13.

—Mr. John C. Gault, General Manager of the Cincinnati, New Orleans & Texas Pacific systems, fell and broke his arm last week. His health was not good before this accident.

—Mr. George Gould, son of Jay Gould and a director in most of the Gould companies, was married at his father's country house near Tarrytown, Sept. 14, to Miss Edith Kingdon, recently an actress in Daly's Theatre.

—Perceval Lowell, General Passenger and Ticket Agent of the Chicago, Burlington & Quincy, has resigned, to take effect Oct. 1. It is expected that he will be succeeded by Paul Morton, now First Assistant General Freight Agent.

TRAFFIC AND EARNINGS.

Indianapolis Car Movement.

The numbers of cars received and forwarded at Indianapolis has been:

	Week ending				
	Aug. 14.	Aug. 21.	Aug. 28.	Sept. 4.	Sept. 11.
1886—Total.....	20,031	19,633	20,521	21,103	21,113
Loaded...	15,635	15,329	16,057	16,390	17,123
1885—Total.....	19,947	23,353	19,730	20,462	.....
Loaded...	.....	.....	14,613	15,966	15,567

There has been a steady increase in the number of loaded cars for three weeks, and the number last week was 10 per cent. greater than last year.

Coal.

Coal tonnages for the week ending Sept. 11 are reported as follows:

	1886.	1885.	Inc. or Dec.	P. c.
Anthracite.....	615,102	743,121	D. 128,019	17 2
Eastern bituminous....	206,449	163,017	I. 43,432	26.6

Receipts at Chicago for August and the eight months ending with August have been:

	August.		Eight months.	
	1886	1885.	1886	1885.
Anthracite.....	164 057	171,839	848,261	745,060
Eastern bituminous....	77,213	70,559	507,027	592,253
Illinois.....	83 785	79 500	670,791	822,759
Indiana.....	58 489	51,959	404,571	380,831
Coke.....	46,687	62,755	350,870	345,460
Total.....	430,831	436,582	2,851,120	2,905,353

There is very little difference in the totals either in August or the eight months, which in view of the much greater production of the iron works, which are extensive at Chicago, is remarkable. For the eight months there is an increase of 11½ per cent. in the anthracite receipts, but a decrease of 21 per cent. in the receipts of Illinois coal.

The river coal shipments from Pittsburgh for the eight months to Aug. 31 have been, in tons:

	1886	1885.	Decrease.	P. c.
To Louisville.....	1,184 593	1,371,490	186,970	13.6
To Cincinnati.....	833,555	940,857	107,302	11 4
Total.....	[illegible]	[illegible]	[illegible]	12.5

The decrease is due to low water, an immense fleet of boats being ready loaded to go down as soon as there is water enough.

The Odd Fellows' Excursion Ticket.

The Passenger Department of the Central Traffic Association, in a circular dated Sept. 10, gives the form of excursion ticket prescribed for the Odd Fellows' excursion to Boston, Sept. 18. The ticket is for parties of not less than five, can be sold only on Sept. 18, on which day the holders must begin the journey to Boston, and will be good for return only from Sept. 23 to Oct. 2; that is, by trains scheduled to arrive by midnight Oct. 2, and only when stamped by the Boston ticket agent.

Live Stock Rates from Minnesota Transfer.

The Northwestern Association announces that live stock forwarded from Minnesota transfer to Association points should be weighed and billed at the weights, rates being 17½ cents per 100 lbs. for cattle, 18 for hogs, 20 cents for sheep in single-deck and 25 cents in double-deck cars. But the following maximum and minimum weights per car-load will be charged:

	Cattle or hogs.	Sheep. Single deck.	Sheep. Double deck.
Minimum	$37	$21	$37
Maximum	40	22½	40

Actual weights should always be shown on the billing, however.

Railroad Earnings.

Earnings of railroad lines for various periods are reported as follows:

	1886.	1885.	Inc. or Dec.	P. c
Eight months to Aug. 31:				
Bur., C. R. & No.	1,721,803	1,864,123	D. 142,320	7.6
Cin., W. & Balt.	1,246,009	1,094,991	I. 151,018	13.8
Cleve., Ak. & Col.	343,023	323,261	I 19,762	6.1
Col., H.Vy. & Tol.	1,469 033	1,475,272	D. 6,239	0.4
Den. & R. G. W.	642,631	616,451	I. 26,180	4.2
Ev. & Terre H.	498,676	470,203	I. 28,473	6.0
Flint & Pere Mar.	1,419,194	1,242.887	I. 176.307	14.2
Gulf, Col. & S. F.	1,282,022	889,697	I. 392,325	44.1
Ind., Dec. & Spr.	268,570	226,715	I. 41,855	18.5
Ma'q., H. & O.	656,551	523,554	I. 132,997	25.4
Mem. & Charles.	808.146	790,964	I. 17,182	2.2
Mobile & Ohio	1,137,681	1,196.295	D. 58,614	5.0
N. Y. Cen. & H. R.	20,571,211	15,181,605	I. 5,389.606	35.5
N. Y., Ont. & W.	861,806	809,562	I. 52,244	6 4
Peoria, Dec. & E.	497,925	463,303	I. 34,622	7 5
Rich. & Danville.	2,484,699	2,450.811	I 33,888	1.4
Va. Mid. Div.	960,956	971,775	D. 10 819	1.1
S. C. Div.	474,279	481,265	D. 6,986	1.4
Col. & Gr'n Div.	368,925	390.761	D. 21.836	5.6
West N. C. Div.	333,9.8	299,380	I. 34,548	11.5
St. L., A. & T. H.:				
Main Line	784,368	786,947	D. 2,579	0.3
Belleville Line.	450,186	462,611	D. 12,425	2.7
St. L., Ark. & T.	1,014,286	629,706	I. 384,580	61.0
Month of July:				
Cairo, V. & C.	70 507	38,124	I. 31,383	8.2
Net earnings	32,097	4,118	I. 27 979	680.0
Ches. & Ohio.	405,508	280,213	I. 124.295	44.4
Net earnings.	135,071	90,830	I. 44.241	48.7
Eliz., Lex. & B. S.	95,846	58,050	I. 37,796	65.1
Net earnings.	35,584	23.748	I. 11,836	50.0
Ches., O. & S. W.	147.418	131,678	I. 15,740	12.0
Net earnings	61.007	50,081	I. 10 926	21.8
Chi. & Grand T.	277 345	210,435	I. 66,910	31.9
Net earnings	70.665	27,790	I. 41,875	150.6
Den. & R. G. W.	85,742	.....	.....	....
Net earnings	22,450	.....	.....	....
Det., G. H. & Mil.	112,175	94,650	I. 17,525	17 4
Net earnings	43,950	27,020	I. 16,930	62.7
Grand Trunk	1.227,520	1,580,580	I. 246,940	11.5
Net earnings	470,680	292,380	I. 178.300	67.8
L. Rock & Ft. S.	48,188	36,393	I. 11.795	32 4
L. Rk., M. R & T.	3.748	3,141	I. 607	19 3
L. Rock Junction.	27,822	19,850	I. 7,972	40 2
L., N. A. & Chic.	178,117	145,397	I. 32,720	22.5
Net earnings	73,780	46,754	I. 27,025	57.8
L., N. O. & Tex.	110,664	68,372	I. 42,292	51.2
Net earnings	23 676 (def.)	3,979	I. 27,655	...
Month of August:				
Bur., C. R. & No.	246,435	225.823	I. 20,612	9.0
Cin., W. & Balt.	183.373	140,412	I. 42,961	30 6
Cleve., Ark. & C.	55.152	47,670	I. 7,482	15.7
Col., H.Vy. & Tol.	226,161	218,006	I. 8,155	3.7
Den. & R. G. W.	89,350	91,313	D. 1,963	2.1
Ev. & T. Haute	76,517	74.530	I. 1,987	2.6
Flint & Pere Mar.	167,198	155.697	I. 12.501	8.0
Gulf, Col. & S. F.	178,703	150,963	I. 27,740	15 8
Ind., Dec. & Spr.	48,871	45,613	I. 3,258	7.1
L., N. A. & Chic.	182,623	157,728	I. 24,895	15.8
Marq., H. & O.	141,799	118.007	I. 23,792	20.1
Mem. & Charles.	129,200	95,824	I. 23,376	24.4
Mobile & Ohio	143,072	149.072	D. 6,000	4.0
N. Y. C. & H. R.	2,980,974	1,950,194	I. 1,030.780	52.9
Peoria, D. & Ev.	88,566	81,015	I. 7,551	9.3
Rich. & Danville.	324,000	322,961	I. 1,039	0.3
Va. Mid. Div.	149,427	144,753	I. 4,674	3.2
South Car. Div.	50,771	56,259	D. 5,488	9.8
Col. & Gr. Div.	34,596	41,327	D. 6,731	16.3
West. N. C. Div.	52,034	46,821	I. 5,213	11.1
St. L., A. & T. H.:				
Main Line	113,754	126,170	D. 12,416	11.8
Belleville Line.	62,893	60,007	I. 2.886	4.8
St. L., Ark. & T.	149,671	103,954	I. 45,717	44 0
Tol., A. A. & N. M.	33,118	24,687	I. 8,431	34.2
First week in September:				
Buff., N. Y. & P.	57,900	54,100	I. 3,800	7.0
Buff., Roch. & P.	28.854	31,133	D. 2,279	7.3
Cairo, V. & C.	15,658	10,178	I. 5,480	53 8
Canadian Pac.	225,000	188,000	I. 37,000	19.7
Central Iowa.	25,184	30,688	D. 5,506	18.0
Chi. & Alton	180,902	179,361	I. 1.541	0.9
Chicago & Atl.	34.529	28,348	I. 6,181	21.7
Chi. & East. Ill.	46.281	40,627	I. 5,754	14.2
Chi. & W. Mich.	30,820	25,545	I. 5,275	20.6
Chi., Mil. & St. P.	554,000	490,049	I. 63,951	13.0
Chi. & N. W.	591,000	495,900	I. 95,100	19.2
C., St. P., M. & O.	126,500	121,400	I. 5,100	4.2
Cin., L, St. L. & C.	57,335	50,800	I. 6,555	12.9
Denver & R. G.	145,920	132,694	I. 13,226	10.0
Flint & P. M.	41,307	3 ,132	I. 5,175	14.3
Det., Lan. & No.	23,868	23,824	I. 44	0.2
Illinois Central:				
Ill. & S. Div.	235,800	212,000	I. 23,740	11.4
Iowa lines	43,100	37,508	I. 5,532	14.7
Ind., Bloom. & W.	72,939	67,935	I. 5,004	7 4
Long Island	96,180	96,053	I. 127	0.1
Louisv. & Nash.	291,610	262,440	I. 29,170	11.1
Marq., H. & Ont.	28,239	25,066	I. 3,173	12.4
Memphis & Chas.	30,843	29,162	I. 1,682	5.8
Mexican Cen.	66,860	61,925	I. 4,935	8.0
Mil. & Northern	12,076	10,238	I. 1,838	18 0
Mil., L. S. & W.	59,600	32,545	I. 27,055	83
N., Y. Ont. & W.	31,862	28,541	I. 3,321	11 6
Norfolk & West.	77,447	59,059	I. 18,388	31.1
Ohio & Miss.	112,576	103,414	I. 9,162	9.0
Oregon R. & N.	116,583	112,917	I. 3,666	3.2
Peoria, Dec. & E.	20,157	17,920	I. 2,237	12 5
St. Jo. & Gd. I.	29,065	24,293	I. 4,772	19.6
St. Louis & San F.	109,500	85,700	I. 23,800	27.7
St. P. & Duluth	41,500	39,825	I. 1,675	4.2
Wabash	270,857	265,452	I. 11,405	4.3
Wisconsin Cent.	27,910	24,856	I. 3,054	12.3

Weekly earnings are usually estimated in part, and are subject to correction by later statements. The same remark applies to early statements of monthly earnings.

Western Traffic Association.

Commissioner Blanchard has appointed a Joint Agent for the Central Traffic Association at Pittsburgh, who will also supervise Bellaire and Parkersburg. His duties will be the examination and checking of waybills and car records of roads in the Central Traffic Association terminating at those points; the weighing of live stock and dressed meats not weighed before arrival and the charging and collecting by the carrying company of excess weights so ascertained at the authorized tariff from points of shipment.

Lumber Pool to Missouri River Points.

Mr. J. W. Midgley has awarded the following percentages of this traffic, which is covered by a separate pool:

Chic., Mil. & St. P.	23	Ch., Minn., St. P. & Om.	15
Chic., Bur. & Q.	20	Wabash	8
Chic. & N. W.	16	Mo. Pacific	2
Chic., Rock I. & P.	16		

This traffic is always causing trouble, and is very difficult to manage, because there are many widely separated sources of supply, the lumber coming from mills in Northwestern Wisconsin, and on the Mississippi, between Iowa and Illinois, from yards at Chicago, and directly from interior Michigan mills. Formerly a great deal also came from Toledo, but probably very little goes so far west from Toledo now.

Chicago Shipments Eastward.

The report of the Board of Trade of the shipments eastward for the week to Sept. 11, which includes shipments to local as well as through points, gives the following tonnages by the seven pool roads:

C. & G. T.	Mich. Cen.	Lake Shore.	Nickel Plate.	Ft. Wayne.	R. C. & Ft. L	B. & O.
3,745	12,543	6,280	4,034	4,462	5,649	1,777

or a total of 38,490 tons, against 30,844 the week before. The three Vanderbilt roads thus carried 22,857 tons, or nearly three-fifths of the whole; the two Pennsylvania roads, 10,111, or 26¼ per cent. of the whole.

Western Weighing Association.

The number of cars weighed by this (Chicago) Association is reported by Capt. J. R. Wheeler, Commissioner, as follows:

	1886.	1885.	Increase.	P.c.
August	67,618	58,261	9,357	16.0
8 months to Aug. 31	721,244	624,222	87,022	13.7

The cars weighed are those going over the lines west of Chicago.

Traffic Notes.

Captain Sanborn, Master of Transportation of the Old Colony Railroad, estimates that 700 loaded passenger cars have arrived and departed daily at Boston stations this season, besides 200 empties.

The competition among express companies has greatly reduced their charges recently.

East-bound rates from California terminal points to Chicago and St. Louis were reduced to 50 per cent. of the tariff rates Sept. 7, with a minimum of 50 cents per 100 lbs., green fruit is not included.

A great deal of cutting of passenger rates from Cincinnati to New York is reported, going two or three dollars below the tariff. Fares from Cleveland to New York are also demoralized.

A meeting of the Central Traffic Association will be held at Commissioner Blanchard's office in Chicago Sept. 29.

The first meeting of the season of the Western Railway Club will be held in Parlor 4, Grand Pacific Hotel, Chicago, Wednesday, Sept. 22, at 2 p. m., when officers will be elected and an amendment to the constitution submitted.

Commissioner Faithorn has awarded the following percentages in the Cedar Rapids Association: Burlington, Cedar Rapids & Northern, 38; Chicago & Northwestern, 37½; Chicago, Milwaukee & St. Paul, 24½. These take effect June 1, a new award having been called for from that date by the Cedar Rapids road.

Express War.

The establishment of an express line by the Erie is probably the occasion of a lively express war, which is said to have brought the rate between New York and Cleveland down from $2.25 to 75 cents per 100 lbs.

RAILROAD LAW.

Suing a Pool.

In Kansas City, Mo., Sept. 6, a long talked-of suit to dissolve a railroad pool was filed to-day. The title of the case is as follows: In the Circuit Court of Jackson County, Missouri, at Kansas City, the state of Missouri, on the relation of Banton G. Boone, Attorney-General of state, plaintiff, vs. Chicago & Alton Railroad Co.; Chicago, Burlington & Quincy Railroad Co.; Chicago, Rock Island & Pacific Railway Co.; Hannibal & St. Joseph Railway Co.; Kansas City, St. Joseph & Council Bluffs Railroad Co.; Missouri Pacific Railway Co.; Solon Humphreys and Thomas E. Tutt, Receivers of the Wabash, St. Louis & Pacific Railway Co.; Atchison, Topeka & Santa Fe Railroad Co.; Kansas City, Clinton & Springfield Railway Co.; Kansas City, Springfield & Memphis Railroad Co.; Kansas City, Fort Scott & Gulf Railroad Co.; St. Louis, Fort Scott & Wichita Railroad Co.; St. Louis & San Francisco Railroad Co.; and the Union Pacific Railroad Co., defendants.

This petition sets forth that defendants entered the state and were allowed to build lines with the understanding that they should not enter into any agreement or pool for the purpose of combining in the matter of freight rates, but that there should be a healthful competition between the same; that notwithstanding this, the defendants have formed a pool or association unrecognized by law or justice; that this has proved greatly detrimental to the business interests of Missouri, and that by it merchants of Kansas City, St. Louis and St. Joseph are compelled to pay much higher freight rates to the Gulf of Mexico than is charged to the people of other states for the same and greater distances; wherefore the petitioners pray that the Court decree the said association to not continue in the present contract, and on failure to comply with said decree the Court will issue its writ of sequestration against the property of the defendants. Judgment for costs is also asked.

Reincorporation of Railroad Companies under an Iowa Law.

Governor Larrabee, of Iowa, has directed the Attorney-General to bring suits against the Chicago & Northwestern, the Chicago, Milwaukee & St. Paul, the Illinois Central, and the Chicago, Burlington & Quincy railroad companies to compel those corporations to comply with the so-called Sweeny Law, chapter 20, acts of the Twenty-first General Assembly. The act requires all corporations doing business in Iowa to reincorporate under the state laws, the object being to prevent transferring suits to the Federal courts. It is understood the corporations base their refusal on the grounds that the law violates a constitutional provision. It is expected that the suits will probably be carried to the highest Federal courts.

OLD AND NEW ROADS.

Atchison, Topeka & Santa Fe.—In the suit of Clarence H. Venner against this company, in which he sought to restrain it from acquiring the Gulf Colorado & Santa Fe and from building through the Indian Territory, on the ground that its charter and the laws of Kansas do not authorize it to go beyond that state, the United States Circuit Court at Topeka, Judge Brewer, Sept. 14, sustained the contested power of the company, both by virtue of its charter and of subsequent statutes of the state of Kansas. The Court decides that this company was originally incorporated with the distinct purpose of extending its line southwestwardly to Santa Fe and southwardly to the Gulf of Mexico, and that acquisition of other lines beyond the limits of the state of Kansas was only carrying out the original plan of its projectors. In addition to this, the decision holds that the general laws of Kansas permit railroad companies to extend their lines beyond the borders of the state. The contract between the Atchison and Gulf companies, which was made last winter, provided for an exchange of the stock of two of the companies, and Judge Brewer holds this to be a lawful and proper exercise of power of the companies, and that Venner cannot be permitted to buy the stock of the Atchison Company and then come in and attack its validity or the validity of its contracts.

Beech Creek.—A telegram from Philadelphia says that Cornelius Vanderbilt, of New York; Joseph M. Gazzam, of Philadelphia, and M. E. Olmstead, of Potter County, Pa., who are interested in the Beech Creek Railroad, have purchased the controlling interest in the Clearfield Bituminous Coal Co., the mines of which are on the line of this railroad. Efforts were being made by the Pennsylvania Railroad to control the coal company, and its control was purchased by Cornelius Vanderbilt and others to prevent this and secure the tonnage to the Beech Creek road. The coal company is to be reorganized and the capital stock reduced.

Brenham & Brazos Valley.—The line has been surveyed from Brenham north by west to Gause, Tex., 50 miles, under the direction of Murray Harris, Chief Engineer. The line is seven or eight miles east of the Gulf, Colorado & Santa Fe at Gause, and gets nearer and nearer till it strikes it and the Austin Branch of the Houston & Texas Central at Brenham.

Buffalo, New York & Philadelphia.—With regard to the reported refusal of the owners of Warren & Franklin bonds to accept the reorganization scheme, which requires them to accept par and interest for their 7 per cent. bonds not due for 10 years, and guaranteed by the Philadelphia & Erie, it is said the Reorganization Committee has nearly one-third of the issue ($1,500,000), and the Philadelphia & Erie more than one-third, all of which will accept in reorganization, and that if the majority insist on their opposition the Committee may deposit the principal with the court or give security that it will be paid at maturity. The report that this part of the property has earned the interest is denied; it has not earned more than 5 per cent.

Burlington, Cedar Rapids & Northern.—Work is progressing rapidly on the branch from Ellsworth, Minn., westward to Sioux Falls, which will be near the Iowa line and only a few miles south of the St. Paul & Omaha's line.

Canada Atlantic.—The contractors for this road, connecting St. Albans, Vt., with Ottawa, have finished their work and turned the road over to the company. It is 158.7 miles long, from a point near Ottawa, Ont., east by south St. Albans, Vt., and has been in operation to Rouse's Point, N. Y., since June.

Canadian Pacific.—It is reported that the company will not make the extension to the proposed Pacific terminus at Port Moody until further legislation has been procured.

Cape Railway.—Track has been laid to Cape Formentine, N. B., and it is expected that trains will run through there to Sackville in October.

Central Massachusetts.—The Boston *Traveller* says: "The proposition which the Boston & Lowell Railroad Co. has made to the committee of the Central Massachusetts directors, having in charge the arrangements for a lease of that line, is said to contemplate a lease of the road completed to Northampton, for a term of 99 years from Dec. 1, 1886. The plan, roughly outlined, proposes an issue of $2,000,000 of 5 per cent. bonds on the Central Massachusetts road, guaranteed by the Boston & Lowell Co. Of the proceeds of these bonds $250,000 will be used to pay off the company's floating debt, and $400,000 will be required to properly equip the line when completed to Northampton.

"Under the terms of the present contract between the two roads the Boston & Lowell has the earnings upon its own line between Cambridge and Boston, and a charge in addition for the use of terminals at this end of the line. Under the new deal the Lowell proposes to throw in the use of track and terminals for 99 years for a fixed sum, say $350,000 in bonds, and at 5 per cent. this would make a sum equal to an annual rental of $17,500 per annum. This leaves $1,000,000 of the new issue of bonds to extend and complete the road from Jefferson to Northampton. The Boston & Lowell proposes to retain all the gross earnings up to $500,000 per annum; from $500,000 to $1,000,000 the stockholders of the Central are to receive 20 per cent., or $100,000 each year. This would give dividends of 2½ per cent. upon the preferred stock. For earnings in excess of $1,000,000 the Central stockholders are to receive 25 per cent. of the gross."

Central Vermont.—The annual report of this company for the year ending June 30 shows:

	1886.	1885.	Inc. or Dec.	P.c.
Gross earnings	$2,533,938	$2,515,320	I. $18,618	0.7
Op. expenses	1,738,494	1,722,515	I. 15,979	0.9
Net earnings	$795,444	$792,805	I. $2,639	0.3
Rentals	357,750	359,500	D. 1,750	0.3
Balance	437,694	433,305	I. 4,389	1.0
Interest and taxes	389,633	.....	.....	....
Surplus	$48,061	.....	.....	....

Thus, there is very little change. The gross and net earnings and expenses for the five calendar years ending with 1884, had been:

	1880.	1881.	1882.	1883.	1884.
Gross earn.	$2,947,502	$2,692,518	$2,700,834	$2,797,223	$2,578,745
Expenses	2,151,536	2,046,830	2,219,398	2,033,907	1,766,167
Net earn.	$796,026	$645,688	$541,436	$763,529	$812,578

In all of these years the gross earnings were greater than last year, but owing to a great decrease in expenses the net earnings were exceeded only in 1880 and 1884.

Chicago & Atlantic.—The report to the Ohio Railroad Commissioner, for the year ending June 30, 1886, compares as follows with the two preceding years:

	1886.	1885.	1884.
Gross earn.	$1,385,431	$1,346,870	$1,447,713
Expenses	1,188,264	1,098,550	1,073,901
Net earn.	$197,167	$248,317	$373,812
Unfunded debt	2,469,875	2,469,041	2,440,495
Funded debt	7,795,000	6,500,000	6,500,000

The gross earnings the last year were $5,170 and the net $736 per mile, the working expenses absorbing 85½ per cent. of the earnings.

A meeting of [illegible] was held in Buffalo [illegible] to decline the Erie Co.'s proposition to give them for their bonds 40 per cent. of their face in new first-mortgage bonds gua-

ranteed by it, bearing 4 per cent. for three years and 5 per cent. thereafter.

Chicago, Burlington & Northern.—A contract has been made for the use of the bridge at Dunleith, which enables this company to get into Dubuque.

Surveys are reported for a proposed branch from Maiden Rock, Wis., (about 55 miles below St. Paul), northward toward Lake Superior, and from Winona, Minn., westward through Rochester, the latter being on the Winona & St. Peter Railroad.

Chicago & St. Louis.—It is reported that this company will at once begin to survey a line from Pekin south to Springfield, Ill., to connect with the St. Louis & Chicago.

Cincinnati, Wabash & Michigan.—This company now pays its men by checks.

Cincinnati, Jackson & Mackinaw.—It is expected to have the track done to Lewisburg, O., very soon, and to Germantown, Nov. 1. The construction is in charge of Mr. A. V. Rice.

Cincinnati & Westwood.—Suit was brought Sept. 11 for a dissolution of this company, which owns 5¼ miles of narrow-gauge track, extending from Brighton, a station on the Cincinnati, Hamilton & Dayton, within the Cincinnati city limits, to Westwood. The Ohio Railroad Commissioner recently ordered the company to stop operating the road until certain trestles and bridges were put in repair. The petition filed alleges that it would require a large sum of money to make these repairs, and the object of the corporation has failed. The abandonment of the road has left the people of Westwood without means of reaching the city except by private conveyance. The company has outstanding $40,000 in bonds, upon which no interest has been paid for nine years, and $100,000 in stock.

Cleveland, Columbus, Cincinnati & Indianapolis.—Earnings, etc., for the half-year to June 30 were:

	1886.	1885.	Inc. or Dec.	P.c.
Gross earn	$1,819,227	$1,642,968	I. $176,259	10 7
Expenses	1,242,268	1,319,314	D 77,046	5.9
Net earn	$576.959	$323.654	I. $253,305	78.3
Interest, taxes, etc	414.113	392.364	I. 21,749	5.5
Surplus	$162,846		I. $231,554	
Deficit		68,708		
Additions	104 541	86 457		

The gain in gross earnings is less than most roads greatly affected by trunk line rates have reported. The surplus over fixed charges this year was equal to $1.09 per share of stock.

Columbus & Eastern.—Grading is begun on the extension from Hadley Junction to Columbus, O., 28 miles, which is to be completed this year.

Duluth, Huron & Denver.—The company is securing right of way for a line from Sauk Rapids, Minn., south of west through Benson, to Appleton, Minn., and a little thence south west to Huron, Dak. Such a line would serve to carry to Duluth, but not to Minneapolis.

Duluth to New York via Canada.—A report has been started that it is intended to make a railroad line from Duluth to a connection with the New York Central by way of Sault Ste. Marie, and the Duluth, Superior & Michigan, the Duluth, South Shore & Sault Ste. Marie, and the Brockville, Westport & Sault Ste. Marie are named as the companies under whose charters the road is to be built, though the completed Detroit, Mackinac & Marquette is spoken of as a link in the line. The distance in an air line from Duluth to Brockville is only about 825 miles, and the proposed railroad need not deflect greatly from it. From Brockville to New York is 366 miles, and the route would not be much shorter to New York than the existing lines *via* Chicago; it would be a much shorter line to Montreal, however, than any now existing; but it is not necessary to build a new railroad all the way through the barren Lake Superior country to get to Sault Ste. Marie; for the Northern Pacific has 71 miles in operation from Duluth east to Ashland, the Milwaukee, Lake Shore & Western has 98 miles from Ashland east to Watersmeet, which is within about 50 miles of the Marquette, Houghton & Ontonagon, which, with the Detroit, Mackinac & Marquette, affords a completed line 125 miles farther, to a point within 50 miles of the Sault. Thus of a line 400 miles long from Duluth to Sault Ste. Marie, only about 100 miles remain to be built. Gen. Samuel Thomas and Calvin S. Brice, who were prominent in the "Seney syndicate," are said to be promoting this enterprise.

Erie Despatch.—General Manager G. W. Ristine, Sept. 1 gave instructions to report all movements of Erie Despatch cars, Great Western Despatch cars, South Shore Line cars, Erie & Pacific Despatch cars, Anglo-American Provision Co.'s cars (Anglo-American Refrigerator Car Co., owners), and movements of New York, Lake Erie & Western, and New York, Pennsylvania & Ohio common cars west of New York, Pennsylvania & Ohio terminals, to C. W. Barnes, General Western Agent the Railway Car Association, No. 205 La Salle street, Chicago, Ill. The mileage will continue to be settled as heretofore. A new equipment list will be issued at an early date.

Evansville & Indiana.—Articles of incorporation of this company were filed Sept. 11 with the Secretary of State of Indiana. Its projected line is from Elnora, Daviess Co., on the Evansville & Indianapolis Railroad, through Martin, Bartholomew, Decatur, Rush, Fayette and Wayne counties to Richmond, 120 miles. The capital stock is $1,500,000. D. J. Mackey has subscribed for $787,000 of it and Wm. Heilman for $700,000.

Fremont, Elkhorn & Missouri Valley.—This company gives notice that its Lincoln Extension was completed and opened for business Sept. 13, to Wahoo, Neb., the county seat of Saunders Co., sixty miles from Missouri Valley. It was to be completed to Lincoln by the end of the month.

Gainesville, Henrietta & Western.—Burkett & Murphy, of Palestine, Tex., have the contract for building the 79 miles of the new Texas road which have been located.

Grand Trunk.—The following statement of result of the working in the first half of the year has been cabled to London:

	1886.	1885.	Increase.	P. c.
Gross receipts	£1,557,041	£1,423.857	£133,184	9.4
Working expenses	1,097,714	1,090.737	6,977	0.6
Net revenue	£459.327	£333,120	£126,207	38.0
Net revenue credits	35,307	24,871	10,436	40.0
Total net receip's	£494,634	£357,991	£136.643	38 2
Net revenue charges	414,263	406,298	7,965	2.0
Credit balance June 30	£80,371		£128,678	
Deficit		£48.307		

The deficiency of net revenue to meet the preference charges at Dec. 31, 1885, was:

For the Grand Trunk Co	£35,876
For the Chicago & Grand Trunk Co	93,728
Making a total deficiency of	£129,604

Against this deficiency there have been received, as has been previously explained:

1. Amount recovered from the city of Grand Haven	£11.472
2. Amount realized in winding up the affairs of the North Shore Railway	26.000
3. Proceeds of sale of Grand Trunk, Georgian Bay and Lake Erie bonds, for which originally no payment was made by the company	37,045
Making a total of	£74,517

In accordance with the statement of the President at the general meeting April 30 last, the Board may defer any recommendation to the shareholders as to dealing with the deficiency.

Greenwich & Rutland.—Mr. Hugh W. Hughes, of Granville, Vt., is working up a project for a railroad from Rutland, Vt., through Granville and Pawlet to Greenwich, N. Y., passing near marble and slate quarries.

Green Bay, Winona & St. Paul.—The company advertises that it will pay the coupons due Aug. 1 on its first mortgage bonds. Of the total issue of $1,600,000, all but $83,000 have accepted the new funding arrangement for settling with the holders of unpaid coupons, which calls for the issue of a new 6 per cent. bond at par in exchange for the coupons named.

Helena, Boulder Valley & Platte.—Bids for the construction of the road will be opened Sept. 18, and work will begin at once, from Jefferson, on the Wickes branch, to Boulder City. It is to be a part of the Northern Pacific system, eventually to be extended to Butte. There are mines, many of them fairly developed, along the line.

Illinois Central.—The Yazoo-Mississippi Valley line was opened for traffic Sept. 1 to Greenwood, Miss., 97½ miles from the main line at Jackson, and 52 miles from last year's terminus at Yazoo City. At the same time a branch of this line was opened from Tchula, some 25 miles south of Greenwood, east by south 13 miles to Lexington, the terminus of a branch of the same length westward from the main line at Durant.

Indiana, Bloomington & Western.—The United States Circuit Court for the Southern District of Ohio, has made an order directing the Receiver to pay to the Cincinnati, Sandusky & Cleveland a monthly minimum rental for June, 1886, of $25,000, with interest from July 1, 1886. This was the monthly rental on which the Indiana, Bloomington & Western defaulted, subsequent monthly rentals having already been paid by previous order of the Court.

Jacobs Creek & Mt. Pleasant.—The work of location of this line in the Connellsville coke region has been begun. It begins at Summit, the terminus of the Pittsburgh, McKeesport & Youghiogheny, to Mt. Pleasant, Westmoreland Co., nine miles, reaching many coke-ovens to which the Youghiogheny road now has access only by the Baltimore & Ohio's tracks.

Joggins.—Contracts for grading on this new New Brunswick Railroad have been let to D. Baldwin, P. Wood and J. Stewart, two miles each. Duer & Porter have the contract for piles and trestle work, R. L. Black, for supplying hemlock timber for bridge piers.

Kansas City & Omaha.—The contract for grading between Sultan and Fairchild, Neb., was to be let last week, and it is said to be the intention to have the track down as far east as Sutton this year.

Lake Shore & Michigan Southern.—About midnight Sept. 10, a dynamite bomb was exploded in the signal tower at the intersection of the stockyards tracks with the main line, just south of Chicago, throwing the signalman to the ground, and tearing and twisting the pneumatic pipes and destroying the other apparatus. The same evening, a switch was misplaced while a train of cars was passing it, and 15 of them were thrown from the track. A former switchman was arrested for throwing the switch.

Louisville & Nashville.—Work was begun Sept. 2 on a branch two miles long from Bardstown to Springfield, Ky.

Memphis, Kansas & Western.—The President, Mr. A. C. Kirby, reports that $600,000 of the company's bonds have been subscribed for in Southern Kansas, and that the route has been surveyed through Sumner, Cowley and Sedgwick counties, and that a force of 800 men will begin work at Baxter Springs Oct. 1.

Mexican National.—Mr. H. W. Smithers, the New York representative of Matheson & Co., the largest foreign holders of this company's bonds, has issued a circular advising the bondholders not to sign the plan of the bondholders' committee adopted July 16. Matheson & Co., with a syndicate, were the purchasers of an issue of $5,000,000 of first-mortgage bonds, which, in addition to a lien on the road, has attached a collateral trust, under which a certain amount of Mexican government subsidy is deposited as additional security.

Minneapolis & Pacific.—It is reported that surveys have been made for branches extending northward from the main line, one to Moorhead, Minn., and further north, and one from Elbow Lake to Fergus Falls, Minn.

Ties are being delivered at Moorhead, Minn., for this road, which, it is said, will be completed to that place this year.

Minneapolis, Sault Ste. Marie & Atlantic.—The company is building 72 miles of road this year, from Ingram, the last year's terminus, eastward to the Milwaukee, Lake Shore & Western at Rhinelander, which will make it 140 miles long from its Western terminus on the North Wisconsin Branch of the St. Paul & Omaha at Turtle Lake, which is 75 miles from Minneapolis and 65 from St. Paul. So far 40 miles of track have been laid this year to a point 13 miles east of Prentice, where it crosses the Wisconsin Central, and the grading and bridging are progressing so that it is hoped to reach Rhinelander with the track about Nov. 1. The company has recently received three new locomotives from the Baldwin Works, and 100 box cars and 75 flat cars from the Haskell & Barker Co., of Michigan City.

Missouri Pacific.—Carlisle Bros., of Pueblo, Col., have the contract for the road from Weeping Water southeast to Nebraska City, Neb., 20 miles.

New York, Chicago & St. Louis.—Argument in the suit for foreclosure of the second mortgage for $10,000,000 was begun in Cleveland Sept. 14, with a vast army of eminent counsel representing the several different interests. Judge Hale, for the Union Trust Co., trustee of the second mortgage, the plaintiff, claimed that on account of default of interest on the mortgage bonds the mortgage should be foreclosed and the property sold.

Judge Hoadly, in behalf of the defendant, the New York, Chicago & St. Louis Company, said that the first defense was that at the time the transfer of stock, etc., was made there was no lawful corporation. The organization was in conflict with the constitutions of Illinois and Pennsylvania, and the laws of Ohio and New York. A party of gentlemen met in New York and determined to organize a corporation for profit to themselves. They organized a syndicate (commonly known as the Seney syndicate) and appointed a committee of three, Messrs. Seney, Martin and Lyman, who wrote a contract by which it should pay itself $14,666,666 to build the road, and entered into a contract with Brown, Howard & Co., consisting of Columbus R. Cummings, W. H. Brown and W. B. Howard, all members of the original syndicate. It was agreed that stock and bonds should be issued before the construction of any part of the road. Afterward a part of the syndicate concluded they did not have money enough and were allowed an additional sum, and the mortgage bonds and stock were increased. Then there was a pretended consolidation of roads in different states. The syndicate expended something like $21,000,000, but received over $60,000,000 in securities. "We hold," said Judge Hoadly, "that there cannot be a valid mortgage on a road unless there is actually a road and stockholders, and it is not in the power of directors to sell bonds at less than 75 cents on the dollar, and in this case bonds were issued by members of the syndicate to themselves for nothing. There is no law in Ohio authorizing a railroad company to consolidate with any other railroad company except one organized and incorporated under the laws of a state adjoining Ohio, and whose road is built or in process of construction."

Mr. Pond, who represents the Lake Shore Company, a judgment creditor, also claimed that the consolidation was unlawful and the issue of the mortgage unauthorized. Judge Burke, representing Sheltar and McGourkey, Trustees of the car trust certificate, said that if there were any wrongs committed in the consolidation or the issuing of mortgage bonds they had not inherited them. It made no difference, so far as his clients were concerned, whether it was a legal corporation or not. They furnished property for the road and wanted it either returned or paid for. The Central Trust Company, of New York, which holds the first mortgage, wanted no decree made which would injure its security.

Northern Pacific.—In a case involving the right of this company to lands embraced in a part of the Crow Indian reservation released under an agreement of sale ratified by Congress April 11, 1882, and decided by the Interior Department, 1884, Acting-Secretary Muldoon has overruled the company's motion for a review.

Oregon Improvement Co.—The report for the year ending Nov. 30, 1885, has just made its appearance. The total earnings for the year were $2,882,207, against $3,557,153 in 1884; the expenses for 1885 were $2,249,746, against $2,575,105 in 1884. This large decrease was due to the failure of the California wheat crop, the general depression of business on the Pacific coast, the absorption of traffic by through rail lines, the readjustment of the steamship pools, and the competition from the cheap imported foreign coals. During the six months ending May 31, 1886, however, a far more favorable exhibit is made, the gross earnings for that period being $1,178,834, against $1,367,776 for the corresponding period of 1885—a decrease of only $188,942. For the month of June of the present year the net earnings were $86,120, against $45,391 for the corresponding period of last year, showing an increase of $40,729. This is one of the Villard companies.

Parsons & Pacific.—Grading is progressing from Parsons southwest to Coffeyville, Kan., near the Indian Territory, and there is talk of building north from Parsons to Paola, 90 miles, and southward across the Indian country.

Pittsburgh & Western.—The conductors and brakemen having struck for an increase of 10 per cent in wages, the company granted it to the conductors Sept. 8, but they would not go to work until the brakemen also were given an advance, which was done the next day.

Prince Edward Island Tunnel.—Engineers are testing the bottom of the Northumberland Strait, between the island and the main and, where it is proposed to tunnel. So far, brick clay and no rock has been found.

St. Catharines & Niagara Central.—Bids are invited for the grading between Thorold and St. Catharine's.

Southern Pacific Co.—The following is the July statement of this company:

	Pac. system. 3,043 miles.	Atlan system. 1,673 miles	Total. 4,716 miles.
Gross earnings	$2,035,581.57	$681.614.95	$2,717,196.52
Operating exp	1,006,295.94	476,754 89	1,483,050 83
Surplus	$1,029,285.63	$204 860.06	$1,234,145 69
Rentals from leased lines			46,680.50
Total			$1,280,826.19
Less interest on bonded debt, sinking funds, taxes and all other expenses and charges			1.204,579 93
Net profit			$76,246.26

Texarkana & Northern.—A survey has been completed northward near the line between Arkansas and Indian Territory, to Ft. Smith, Gustave Knobel in charge of surveys.

Union Pacific.—The Denver, Marshall & Boulder road, recently completed from the Colorado Central line at Semper to Boulder lessens the time of passenger trains between Denver and Boulder by one hour.

Wisconsin Central.—A circular sent to the stockholders informs them that Mr. Edwin A. Abbott, one of the trustees in possession; Mr. C. L. Colby, President of the company, and others interested in iron mines on the route, propose to build a railroad—about 50 miles long—from the Wisconsin Central, near Winnebosh or Penokee, eastward to Lake Agogebic, Ontonagon County, Mich., or near to it, to carry ore to Ashland, which would pass over the Central for about 30 miles, and it will give the new line a rebate of 10 per cent. on its *pro rata* share of all earnings from traffic received from it, provided that it be completed within two years to the Colby mines at Bessemer. Wisconsin Central stockholders are invited to subscribe $1,500,000 for the new lines, receiving for each $5,000, $5,000 50-year 5 per cent. first mortgage bonds, $1,000 5 per cent. income bonds, and $2,600 in stock. The privilege to subscribe expired Sept. 11.

ANNUAL REPORTS

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East St. Louis & Carondelet.

This company owns a line from East St. Louis, Ill., to East Carondelet, 11.5 miles in length. It is controlled and practically owned by the Pennsylvania Company. The report is for the year ending Dec. 31.

The road is used by all the roads terminating in East St. Louis as a connecting line and freight transfer to South St. Louis and Carondelet and roads running west and south from St. Louis.

The earnings for the year were as follows:

	1885.	1884.	Inc. or Dec.	P.c
Earnings	$73,709	$73.408	I. $301	0.4
Expenses	57.765	66,638	D. 8,873	13.2
Net earnings	$15,944	$6,770	I. $9,174	135.5
Gross earnings, per mile	6,410	6,383	I. 27	0.4
Net " "	1,386	589	I. 797	135.5
Per cent. of expenses	78.4	90.8	D. 12.4	..

The interest on the bonds was $14,000, leaving a net profit of $1,944 for the year, against a loss of $7,230 for the preceding year.

Pennsylvania Company.

The report of this company for the year ending Dec. 31 last shows that the company owned or leased and operated directly the following lines of railroad:

	Miles.
Pittsburgh, Fort Wayne & Chicago	469.9
Alliance, Niles & Ashtabula	24.9
Massillon & Cleveland	12.2
New Brighton & New Castle	12.5
New Castle & Beaver Valley	14.9
Lawrence Railroad	22.0
Ashtabula & Pittsburgh	62 6
Erie & Pittsburgh	84.5
Cleveland & Pittsburgh	198.3
Northwestern Ohio	80.0
Indianapolis & Vincennes	128.8
Jeffersonville, Madison & Indianapolis	201.5
Total	1,312 1

In addition to this mileage the company controls the Pittsburgh, Cincinnati & St. Louis, 597; Chicago, St. Louis & Pittsburgh, 580.5; St. Louis, Vandalia & Terre Haute, 158.3; Cincinnati, Richmond & Fort Wayne, 85.6; East St. Louis & Carondelet, 11.5; a total of 1,432.9 miles. This makes a total of 2,745 miles worked or controlled.

The lines controlled are operated under their own organizations, and their reports are published separately; summaries of them have already appeared in these columns. The figures given below relate only to the 1,312 miles worked directly by this company. These lines form the northwestern system of the Pennsylvania lines west of Pittsburgh.

The general account is as follows:

Liabilities:	
Capital stock	$20,000,000
First mortgage 4½ per cent. bonds issued	13,750,000
Registered 6 per cent. bonds, secured by guaranteed special stock of P., F. W. & C. Co., issued	3,200,000
Due lessor companies for supplies	831,831
Due to other companies	2,490,554
Due for current expenditures in operating leased roads	1,042,577
Miscellaneous liabilities	402,343
Interest due and unpaid on 6 per cent. registered bonds	2,063
Interest due and unpaid on 4½ per cent. bonds	313,380
Reserve fund, leased roads	2,565,409
Balance to credit of profit and loss account	2,612,510
Total	$47,210,667
Assets:	
Securities	$32,685,638
Bills receivable	219.912
Equipment	1,104,699
Real estate	161,566
Uni n Line property	2,929,229
Due for betterments to leased roads	178.615
Due by other companies	1.574,643
Due by station agents	1,095,419
Stock of supplies	1,008,469
Miscellaneous assets	459,089
Cash	482,528
Philadelphia Trust, Safe Deposit & Insurance Co., Trustees, 6 per cent. bonds, to meet interest and sinking fund	2,572
National City Bank, New York, agents, 4½ per cent. bonds, to meet interest	313,380
Sinking funds	1,433,438
Sinking funds for leased roads	2,563,409
Redemption of P., F. W. & C. equipment bonds	996,000
Total	$47,210,667

There was no change in the stock or funded debt during the year. The ownership of railroads is all through holdings of stock or bonds.

The income account, condensed, is as follows:

Net earnings Union Line Bureau		$254,697
Rent of Monongahela Extension		51,147
" real estate		5,126
" equipment		227,334
Profits on leased roads		17,950
Interest and dividends on investments		740,704
Total		$1,296,958
General expenses	$58,193	
Interest on car trusts	136 746	
" " Penna. Co. bonds	762,495	
Advances to Cin., Rich. & Ft. Wayne	12,875	
Losses on leased roads	1,421,321	
		2,391,630
Balance deficit for the year		$1,094,672
Sinking funds leased roads		223,804
Old accounts charged off		221,352
Total debits		$1,539,828
Income account, balance, Jan. 1, 1885		4,152,438
Income account, balance, Dec. 31, 1885		$2,612,510

The profits on the leased lines were on the New Castle & Beaver Valley and the Lawrence roads; the losses were on the Pittsburgh, Fort Wayne & Chicago, the Erie & Pittsburgh, the Cleveland & Pittsburgh, the Massillon & Cleveland and the Indianapolis & Vincennes roads. The other lines are owned by the company or receive the net earnings as rental. In the case of those lines which are wholly owned by this company, through ownership of securities, the profits appear in the income account above in the interest and dividends on investments.

TRAFFIC.

The traffic of all the lines operated directly (1,312 miles) was as follows:

	1885.	1884.	Inc. or Dec.	P.c.
Pass. carried	6,033,791	6,247,575	D. 213,784	3.4
Pass'g'r-miles	186,250,360	165,185,554	I. 21,064,806	12.8
Tons freight carried	14,896,591	14,539,682	I. 356,909	2.5
Ton-miles	1,397,638,207	1,333,735,971	I. 63,902,236	4.8

The increase in traffic was accompanied by a general decrease in rates, as shown in the statements given below.

The traffic of the several lines last year, with the percentage of increase or decrease, was as follows:

	—Passenger miles—		—Ton-miles.—	
Pitts., F. W. & Chi.	134,613,104	I. 21.7	953,564,516	I. 5.0
N. C. & Beaver Vy	957,737	D. 31.0	12,225,096	D. 24.1
Lawrence	545,325	D. 18.3	17,279,082	I. 2.1
Massillon & Cleve	20,512	D. 83.1	81,841	D. 1.4
Alliance, N. & Ash	398,898	D. 21.9	4,221,824	I. 6.5
Erie & Pitts	3,891,113	I. 3.6	43,574,630	I. 7.1
N. Bri. & N. C.	1,204,893		10,266,580	
Cleve. & Pitts.	20,915,815	D. 6.2	217,956,682	I. 4.1
Ashta. & Pitts.	1,336,156	D. 15.7	39,791,768	D. 0.9
Northwest Ohio	2,638,948	I. 11.1	23,187,414	I. 11.5
Jeff., Mad. & Ind.	15,724,895	D. 7.3	60,334,333	D. 3.4
Ind. & Vincennes	4,010,964	D. 10.9	15,152,952	I. 22.6

Seven out of 11 roads show an increase in freight traffic, but all except three of them a loss in passenger traffic.

The earnings per unit of traffic on all the lines were, in cents:

	—Per passenger-mile.—				—Per ton-mile.—			
	Gross earn.		Net earn.		Gross earn.		Net earn.	
	1885.	1884.	1885.	1884.	1885.	1884.	1885.	1884.
Pitts., Ft. W & Chi.	1.56	2.23	0.47	0.81	0.58	0.67	0.14	0.18
N. C. & Beaver Vy	2.80	2.97	0.19	1.03	1.17	1.36	0.02	0 73
Lawrence	2.54	2.56	*1.54	*1.37	0.88	1.08	0.48	0 55
All., Niles & Aso	2 67	2.40	*0.65	0.12	0.84	0.97	0.50	0.57
Erie & Pitts.	2 50	2.66	0.37	0 30	0.73	0.86	*0.02	0.11
New Br. & N. C	1 70	0.60	0.72	*0.50	0.80	1.09	0.66	0.91
Cleve. & Pitts.	2.44	2 42	0.70	0.53	0.83	0.93	0.30	0.32
Ashta & Pitts.	2.58	2.38	*1.09	*1.16	0 70	0.81	0.27	0.29
Northwest O.	2.27	2.51	0.47	*0.14	0.73	0.81	0.10	*0.04
Jeff., Mad. & Ind	2.44	2.45	0.28	0.13	1.22	1.30	0.25	0.31
Ind. & Vincennes	2.66	2.57	*0.64	*0.68	1.27	1.43	0.01	0.01

*Loss.

There was a decrease in freight rates on all the lines, and especially on those which carry much through business.

UNION LINE BUREAU.

The operations of this department are reported as follows:

	1885.	1884	Inc or. Dec.	P. c.
Mileage	$631,777	$553,545	I. $78,232	14.1
Miscellaneous	366	754	D. 388	51.4
Total earnings	$632,143	$554.299	I. $77,844	14.0
Maintenance of cars	279,341	211,051	I. 68,290	32.4
General expenses	98.105	101,729	D. 3,624	3.6
Total	$377,446	$312,780	I. $64,666	20.7
Net earnings	$254,697	$241,519	I. $13,178	5 5
Per cent. of exps	59.7	56.4	I. 3 3	..

The report says: "The Union Line business fairly exemplifies the conditions under which the through traffic of the country was moved during the year 1885. It shows a largely increased volume of tonnage, and a still greater increase in ton mileage, the average haul being 705 miles, as against 671 for the preceding year. The revenue, however, shows a reduction of $13,448, due to the excessively low rate per ton per mile received on this traffic, which was 5.4 mills, as against 7.1 mills for 1884. The expenses of this department were increased by the pursuance of a more liberal policy in the maintenance of its equipment. It is gratifying to note an improvement in the average mileage per day of the Union Line equipment, it being 40.21 miles, as against 34.89 miles for the preceding year.

GENERAL REMARKS.

The report says: "The general decrease in the revenues of your lines arises mainly from the extremely low rates received on freight. There was also a reduction in the volume of the passenger traffic, and in the rates received from the same, both on your Northwestern and Southwestern systems. The tonnage, however, shows a material increase, the gain on your Northwestern lines being 356,909 tons, and on the Southwestern lines 1,165,516 tons. The ton-mileage also shows a large increase. The rates received show a general reduction of about 1 mill per ton per mile, as compared with the preceding year. Much of the traffic was carried at rates very little, if any, above the cost of movement, owing to the severe depression in the general business of the country, and especially in the iron industries, upon the prosperity of which the revenues of some of your most important lines largely depend. The gross earnings on your Northwestern system for 1885 (including the Jeffersonville, Madison & Indianapolis Railroad and the Indianapolis & Vincennes Railroad), were $13,728,010, a reduction of $1,353,259, or nearly 10 per cent., as compared with 1884. This resulted from a decrease of $952,165 in freight traffic, notwithstanding the increase of tonnage as above stated, and of $429,049 in the passenger traffic, the difference being due to an increase in mail and miscellaneous earnings. On the Southwestern system the gross earnings for 1885 (including the Chicago, St. Louis & Pittsburgh Railroad and the St. Louis, Vandalia & Terre Haute Railroad), were $12,043,448, a reduction of $58,743, or 4.85 per cent., as compared with 1884. The revenue from freight traffic increased $279,817, but that from passenger traffic decreased $372,156, the difference being accounted for, as before, by an increase in mail and miscellaneous earnings.

"There was a general reduction in the cost of movement. As it was absolutely necessary to maintain your property in first-class condition, in order to properly move the increased traffic, the utmost care was required to produce the results shown for the year. The motive power and equipment were well maintained, and there were laid on the lines directly operated by your company 6,477 tons of steel rails, and on the lines otherwise controlled 6,627 tons, including 2,908 tons on the Chicago, St. Louis & Pittsburgh Railroad, and 20 tons on the St. Louis, Vandalia & Terre Haute Railroad. There was a general improvement in the load per car and per train.

"The net result for the year was a deficit in meeting the liabilities on the Northwestern lines of $1,094,672, and on the Southwestern of $40,159.

"Under the operations of the sinking fund provided for the redemption of your 4½ per cent. bonds, $533,000 were redeemed up to Dec. 31, 1885, leaving $13,217,000 outstanding. Of the 6 per cent. bonds of your company, secured by the stock of the Pittsburgh, Fort Wayne & Chicago Co. as collateral, $886,000 were redeemed up to the close of the year, leaving $2,314,000 outstanding."

The operations of the leased lines for the year are given in detail below:

PITTSBURGH, FORT WAYNE & CHICAGO.

The earnings of this, the most important of the company's lines, were as follows, on 469.9 miles of road:

	1885.	1884	Inc. or Dec.	P.c
Freight	$5,500,653	$6,111,217	D. $610,564	10.0
Passengers	2,112,038	2,460,410	D. 348,372	14.2
Mail and express	335,708	321,489	I. 14,221	4.4
Other	270,807	270,927	D. 120	....
Total	$8,219,206	$9,164,041	D. $944,835	10.3
Expenses	5,638,602	6,034,889	D. 396,287	6.6
Net earnings	$2,580,604	$3,129,152	D. $548,548	17.5
Gross earn. per mile	17.491	19,569	D. 2,078	10.6
Net " "	5.492	6.682	D. 1,190	17.9
Per cent. of exps	68.6	65 9	I. 2.7	....

The decrease in earnings was entirely due to the large decrease in the rates received on traffic.

The result of the year was as follows:

	1885.	1884.	Inc. or Dec.	P.c.
Net earnings	$2,580,604	$3,129.152	D. $548,548	17.5
Cleve. & P., joint earn.	201,311	261,960	D. 60.649	23 2
Balance	$2,379.293	$2,867,192	D. $487,899	17.0
Rental	3,985,851	2,991,999	D. 6,148	0.2
Deficit	$606,558	$124,807	I. $481,751	380.0

Sinking fund contributions for the year were $104,100. The amount expended by the lessee for betterments last year was $645,867; the amount due on this account at the close of the year was $166,753.

ALLIANCE, NILES & ASHTABULA.

The operations of this line, 24.9 miles, were as follows:

	1886.	1885.	Inc. or Dec.	P.c.
Earnings	$47,522	$49.6 6	D. $2,094	4.2
Expenses	27,662	28,849	D. 1,187	4.1
Net earnings	$19,860	$20.767	D. $907	4.4
Hire of equipment	5.025	4,118	I. 827	19.7
Balance	$14,835	$16,569	D. $1,734	10.5

This road is one of those practically owned by the lessee. The freight showed an increase, chiefly in coal and iron ore.

MASSILLON & CLEVELAND.

The operations of this line, 12.2 miles, were as follows:

	1885.	1884.	Inc. or Dec.	P. c.
Earnings	$5,988	$6.944	D. $1,156	16 6
Expenses	8,596	7,446	I. 1,150	15.6
Deficit	$2 608	$502	I. $2,306	461 2
Rental	20.000	20,000	.....	.....
Total deficit	$22,808	$20,502	I. $2 306	11.3

The earnings of this road have fallen off heavily, chiefly because of the loss of traffic by competition.

NEW CASTLE & BEAVER VALLEY.

The operations of this line, 14.9 miles, were as follows:

	1885.	1884.	Inc. or Dec.	P.c
Earnings	$171,682	$270,245	$98,563	36.5
Expenses	92,688	128,676	35,988	28.0
Net earnings	$78.994	$141.569	$62,575	44.2
Rental	68,673	108,098	39,425	36.5
Profit	$10,321	$33,471	$23,150	69.2

The rental is 40 per cent. of gross earnings. There was an increase in coal and ore, but a decrease in other lines of freight.

LAWRENCE.

The operations of this line, 22 miles, were as follows:

	1885.	1884.	Inc. or Dec.	P. c.
Earnings	$166,236	$204,109	D. $37,873	18.6
Expenses	92,113	115,664	D. 23,551	20 4
Net earnings	$74,123	$88,445	D. $14,322	16.2
Rental	66,494	81,644	D. 15,150	18.6
Profit	$7,629	$6,801	I. $828	12.2

The rental of this line is 40 per cent. of gross earnings. The traffic was about the same, but rates were much lower.

ERIE & PITTSBURGH.

This line is 84.5 miles long, and its trains also use 16.7 miles of the Lake Shore & Michigan Southern track, from Erie to Girard. The operations were as follows:

	1885.	1884.	Inc. or Dec.	P.c
Earnings	$453.138	$484,590	D. $31,452	6 5
Expenses	408,213	394,192	I. 14,021	3.6
Net earnings	$44,925	$90,398	D. $45,473	50.3
Rental	399,558	398,239	I. 1,319	0 3
Loss	$354,633	$307,841	I. $46,792	15.2

During the year improvements were made in the freight house and docks at Erie, costing $40,278; of this the sum of $20,552 was charged to expenses.

NEW BRIGHTON & NEW CASTLE.

The operations of this line, 12.5 miles, were as follows:

Earnings	$105,056
Expenses	26,114
Net earnings	$78 942
Other revenue	910
Total net income	$79,852
Hire of equipment	8,794
Balance, paid as rental	$71,058

This is one of the lines owned. It was not completed until Aug. 18, 1884, so that no comparisons can be made.

ASHTABULA & PITTSBURGH.

The statement for this road, 62.6 miles, is as follows:

	1885.	1884.	Inc. or Dec.	P. c.
Earnings	$338,950	$387,188	D. $48,238	12.5
Expenses	219,009	264,816	D. 45,807	17.3
Net earnings	$119,941	$122,372	D. $2,431	2.0
Hire of equipment	24,010	28 679	D. 4,669	16.3
Profit	$95,931	$93,693	I. $2,238	2.4

This is one of the lines owned by the company. The improvements made included an interlocking switch and signal apparatus at the crossing of the Lake Shore road.

CLEVELAND & PITTSBURGH.

The earnings of this road (198.3 miles), the second in importance of the lines worked by the company, were:

	1885.	1884.	Inc. or Dec.	P. c.
Freight	$1,807,773	$1,948,666	D. $140,893	7.2
Passengers	511,603	545,322	D. 33,719	6 2
Other	96,225	97,238	D. 1,013	1.0
Total	$2,415,601	$2,591,226	D. $175,625	6.8
Expenses	1,518,436	1,712,651	D. 194,215	11 3
Net earnings	$897,165	$878.575	I. $18,590	2.1
Gross earn. p mile	12,181	13,067	D. 886	6.8
Net " "	4,524	4.431	I. 93	2.1
Per cent. of exps	62.9	66.1	D. 3.2	...

Like all the other lines, this road had an increased traffic, but at considerably lower rates.

The result of the year was as follows:

	1885.	1884.	Inc. or Dec.	P.c.
Net earnings	$897,165	$878,575	I. $18,590	2.1
Joint earn., P., Ft. W. & C.	168,414	195,764	D. 27.350	14.0
Freight balances	5,380		I. 5,380	....
Total	$1,070,959	$1,074,329	D. $3,380	0.3
Rental	1,293,137	1,280.187	I. 12,950	1.0
Loss	$222,178	$205,848	I. $16,330	7.9

The contributions to sinking funds for the year were $119,-804. Betterment expenditures were $11,028; the total amount due lessee on this account is $11,862.

NORTHWESTERN OHIO.

The statement for this line, 80 miles, is a follows:

	1885.	1884.	Inc or Dec.	P.c.
Earnings	$269,510	$270,799	D. $1.289	0.5
Expenses	194,443	240,170	D. 45,727	19.0
Net earnings	$75,067	$30,629	I. $44,438	145.2
Hire of equipment, etc.	33,210	35,089	D. 1,879	5 4
Profit	$41,857	*$4,460	I. $46,317	....

*Loss.

This is one of the lines owned by the Pennsylvania Company, and the net profit adds to its income from investments.

JEFFERSONVILLE, MADISON AND INDIANAPOLIS.

The statement for this line, 201.5 miles, is as follows:

	1885.	1884.	Inc. or Dec.	P. c.
Earnings	$1.217.088	$1,304.111	D. $87,023	6.7
Expenses	925,922	1.012,107	D. 86,185	8.6
Net earnings	$291.166	$ 92,004	D. $838	0.3
Adjustment of balances.	32,492	12,063	I. 20,429	170.4
Net balance	$258,674	$279,941	D. $21,267	7.6

The rental paid for this road is the net balance shown above. Contributions to the sinking fund were $15,000. The earnings last year were $6,040 gross and $1,445 net per mile. The expenses were 76.1 per cent. of gross earnings. The business of this line has been much reduced by the building of competing roads.

INDIANAPOLIS & VINCENNES.

The statement for this line, 128.7 miles, is as follows:

	1885.	1884.	Inc. or Dec.	P. c.
Earnings	$318,232	$312,533	I. $5,699	1.8
Expenses	324,079	322,103	I. 1,976	0.6
Deficit	$5.847	$9,570	D. $3,723	38.9
Hire of equipment	3,297	3,332	D. 35	1.1
Interest on bonds	206,000	206,000	....	...
Total loss	$215,144	$218,902	D. $3,758	1.7

This road earned last year $2,473 per mile; the expenses were 101.8 per cent of gross earnings. The policy of developing tonnage for this line by the construction of coal branches is being steadily pursued, and with this view the Green County Branch was last year extended from Island City, Ind., to Dugger, a distance of 7½ miles.

Wilmington & Northern.

This company owns a line from Wilmington, Del., to High's Junction (near Reading), Pa., 70.50 miles, with 16.61 miles of short branches, a total of 87.11 miles. It leases 3.89 miles of track into Reading and 1 mile in Wilmington, making 92 miles worked. The report is for the year ending Dec. 31.

The equipment includes 18 locomotives; 12 passenger, 7 combination and 2 milk and baggage cars; 44 box, 1 stock, 6 lime, 66 gondola aud 4 caboose cars; 12 construction cars.

The general account, condensed, is as follows:

Capital stock		$1,278,050
Funded debt		225,100
Bonds and mortgages		15,500
Current liabilities		48,153
Profit and loss		318,530
Total		$1,885,333
Road and property	$1,810.324	
Materials	20,278	
Current assets, accounts receivable, etc	42,845	
Cash	11,986	
		$1,885,333

The funded debt consists of branch bonds, of which $35,-600 bear 6 per cent. and $189,500 bear 5 per cent. interest. It was reduced $3,600 last year by the payment of that amount of bonds.

The earnings for the year were as follows:

	1885.	1884.	Inc. or Dec.	P. c.
Freight	$241.908	$271.193	D. $29,285	10.8
Passengers	63,051	66.629	D. 3,578	5.4
Mail, etc	8,879	8,234	I. 645	8.0
Total	$313.838	$346,056	D. $32,218	9 3
Expenses	263,588	281.603	D. 18,015	6.4
Net earnings	$50,250	$64,453	D. $14,203	22.1
Gross earn. per mile	3,411	3,978	D. 567	14.2
Net " "	546	741	D. 195	26.3
Per cent. of exps	84 0	81.4	I. 2.6	....

The decrease in earnings was mainly due to the general depression in business and the consequent light shipments from the mills and factories on the line.

The result of the year was as follows:

Net earnings as above		$50,250
Interest on bonds	$12.521	
Redemption of branch bonds	3,600	
	16,121	
Balance, surplus for the year		$34,129

The surplus, with the balance remaining from the previous year, was used for additions to the property. The expenditures included $24,741 for construction, $2,393 for real estate and $7,082 for new equipment.

The traffic for the year was as follows:

	1885	1884.	Inc. or Dec.	P. c
Locomotive mileage	449,501	456,785	D. 7,284	1.6
Passengers carried	254,010	267,650	D. 13,640	5.1
Passenger-miles	3,057,592	3,149,036	D. 91,444	2 6
Tons freight carried	521.286	536,789	D. 15,503	2.9
Ton-miles	13,408,841	14,850,792	D. 1,441.951	9.7
Average rate:				
Per passenger-mile	2.06 cts.	2.11 cts.	D. 0.05 ct.	2.4
Per ton-mile	1.80 "	1.83 "	D. 0.03 "	1.6

The average passenger journey was 12.04 miles; the average freight haul 25.72 miles. The average train was 2.5 passenger or 28 freight cars. The cost of running passenger trains was 35.45 cents per mile; freight trains, 73.63 cents.

A number of improvements were made in the putting in new sidings, reducing grades, and generally in increased facilities for handling traffic at the terminal and junction points.

One locomotive, one combination and two passenger cars were added to the equipment and full repairs made. The vacuum brake on the passenger equipment has been replaced by the Westinghouse automatic brake.

This road is this year receiving a temporary addition to its business by hauling Baltimore & Ohio traffic, and a permanent addition in the form of anthracite coal hauled to Wilmington for shipment southward.

Grand Rapids & Indiana.

This company owns a line from Ft. Wayne, Ind., to Mackinaw City, Mich., 366.59 miles, with 36.91 miles of branches; a total of 403.51 miles. There are 71.01 miles of sidings. The report is for the year ending Dec. 31.

There was an increase last year of 7.03 miles of branch line (noted below) and 1.65 miles of sidings.

The company operates under lease the Cincinnati, Richmond & Fort Wayne (Fort Wayne to Richmond, Ind.), 85.6 miles; the Traverse City road, 26 miles, and the Bay View, Little Traverse & Mackinaw, 5.7 miles, but the earnings of those lines are stated separately and not included with the line owned.

The general account, condensed, is as follows:

Capital stock		$4,985,081
Funded debt		11,567.000
Accounts and balances payable		349,224
Total		$16,901,305
Road and equipment	$13,793,183	
Stock and bonds	49,558	
Materials	99,490	
Accounts receivable	278,121	
Cash	225,089	
Income account, debit balance	2,455,864	
	16,901,305	

The funded debt includes $1,010,000 first mortgage bonds; $431,000 first-mortgage land grant bonds; $3,934,000 guaranteed first-morgage bonds; $2,700,000 mortgage 6s; $3,217,000 mortgage 5s, and the Mackinaw loan of $275,-000.

The equipment of the road includes 56 locomotives; 39 passenger and 21 baggage cars; 824 box, 50 stock, 1,099 flat and 41 caboose cars; 2 special cars, 4 wrecking and derrick cars, 1 pile-driver and 5 snow-plows.

The earnings for the year were as follows:

	1885.	1884	Inc. or Dec.	P.c.
Freight	$1,216,783	$1,324,186	D. $107,403	8.1
Passengers	609,090	665,515	D. 56,425	8.4
Mail and express	63,803	59,410	I. 4,393	7.4
Other	56,467	67,187	D. 10,720	16.0
Total	$1,946,143	$2,116,298	D. $170,155	8.0
Expenses	1,342,428	1,502,578	D. 160,150	10 6
Net earnings	$603,715	$613,720	D. $10,005	1 6
Gross earn. per mile	4,908	5,337	D. 429	8.0
Net " "	1,523	1,548	D. 25	1.6
Per cent. of exps	69.0	71.0	D. 2.0	....

Expenses include taxes. The decrease in expenses was chiefly in motive power and maintenance of way.

The result of the year was as follows:

Net earnings, as above		$603,715
Interest on bonds	$714,100	
Loss on B. V., S. T. & M. lease	3,050	
Advances to Cin., Rich. & Ft. W	27,263	
	744.413	
Deficit for the year		$140,698
Past due coupons, interest paid		35
Debit balance, Jan. 1, 1885		2,315,131
Total debit balance, Dec. 31, 1885		$2,455,864

Expenditures for betterments during the year were $70,-965, the chief items being for new span and sidings and for payment on principal of car trusts.

The traffic for the year was as follows:

	1885.	1884.	Inc. or Dec.	P.c.
Pass. train miles	701,947	683.891	I. 18,056	2.6
Freight "	909,189	966,732	D. 57,543	5.9
Total loco. miles	2,009,635	2,015,033	D. 5,400	0.3
Passenger car miles	2.942,867	2.877.371	I. 65.496	2.3
Freight " "	15,521,213	16.080,603	D. 559,390	3 5
Passengers carried	805,968	913,181	D. 107.413	11 8
Passenger-miles	24,450,155	26,222,264	D. 1,772,109	6.8
Tons freight carried	767,966	768,018	D. 52	....
Ton-miles	99,991,291	100,197,431	D. 206,140	0.2
Av. train load:				
Passengers. No	34 8	38.3	D. 3.5	9.2
Freight, tons	110.0	103.6	I. 6.4	6.2

The average train last year was 4.19 passenger or 17.07 freight cars. Of the freight car mileage 70.5 per cent. was of loaded cars. The average passenger journey was 30.3 miles; the average freight haul 130.2 miles.

The earnings per unit of traffic were as follows, in cents:

	Per pass. mile.		Per ton-mile	
	1885.	1884.	1885.	1884.
Earnings	2 491	2.538	1.217	1.322
Expenses	1.950	2.037	0.866	0.967
Net earnings	0.541	0.501	0.351	0.355

The earnings per train mile last year were $1.21; expenses, $0.83; net earnings, $0.38, an increase of 2.7 per cent. over the previous year.

During the year 2,278 tons of steel rails and 151,789 new ties were used in renewals. There are now only 21 miles of iron in the main line. Much work was done in filling up trestles, renewing bridges and making other improvements. A new logging branch, known as the Osceola Spur, 7.03 miles long was built.

A favorable feature of the business is the steady increase of traffic from small factories and other permanent industries established in the towns and villages along the line.

The operations of three leased lines are reported separately and a summary is given below.

CINCINNATI, RICHMOND & FORT WAYNE.

The earnings of this road for the year were as follows:

	1885.	1884.	Inc. or Dec.	P.c
Earnings	$373,692	$388,768	D. $15,676	3.8
Expenses	284,363	325,196	D. 40,833	12 6
Net earnings	$89,329	$63,572	I. $25,757	40.5
Gross earn. per mile	4,062	4,226	D. 164	3.8
Net " "	971	691	I. 280	40.5
Per cent. of exps	76 1	83.6	D. 7.5	....

Interest on bonds and advances amounted to $169,164, showing a deficit of $79,735 for the year. The total deficit on the lease of this road up to Dec. 31 last was $988,467. This deficit is supplied jointly by the Grand Rapids & Indiana Co. as lessee and by the Pennsylvania Co. and the Cincinnati, Hamilton & Dayton Co. as guarantors of the lease.

Trains on this road ran 377,098 miles; passenger cars ran 538,018 miles and freight cars 3,342,184 miles. The trains carried 172,855 passengers 4,263,845 miles and 337,266 tons of freight 22,099,031 miles. The average rate received was 2.577 cents per passenger-mile and 1.118 cents per ton-mile, the net result being a deficit of 0.376 cent per passenger-mile and a profit of 0.401 cent per ton-mile.

On this road 612 tons of steel rails and 23,342 new ties were used in renewals. There are now 271½ miles of track laid with steel.

TRAVERSE CITY.

The earnings of this road for the year were as follows:

	1885.	1884.	Inc. or Dec.	P. c.
Earnings	$36.675	$32,059	I. $4,616	14 4
Expenses	28,123	30,364	D. 2,241	7 3
Net earnings	$8,552	$1,695	I. $6,857	404.5
Gross earn. per mile	1,411	1,233	I. 178	14.4
Net " "	329	65	I. 264	404.5
Per cent. of exps	76.7	94.7	D. 18.0	....

Interest on the bonds was $7,560, leaving a balance of $992, surplus for the year.

Trains on this road ran 50,009 miles; passenger cars ran 75,874 and freight cars 105,660 miles. The trains carried 32,740 passengers 688,784 miles and 30,464 tons of freight 495,237 miles. The average receipt was 2.532 cents per passenger-mile and 3.187 cents per ton-mile.

BAY VIEW, LITTLE TRAVERSE & MACKINAW.

The earnings of this road for the year were as follows:

	1885.	1884.	Inc. or Dec.	P c.
Earnings	$4,805	$4,883	D. $78	1.6
Expenses	7,855	8,687	D. 832	9.6
Deficit	$3,050	$3,804	D. $754	19.8
Gross earnings, per mile	843	860	D. 17	1.6
Per cent. of expenses	163.5	177.9	D. 14.4	....

Trains on this road last year ran 21,802 miles. Passenger cars ran 20,218 miles and freight cars 6,438 miles. The trains carried 25,966 passengers 145,025 miles, and 3,421 tons of freight 18,162 miles, the average receipt being 1.752 cents per passenger-mile and 7.831 cents per ton-mile.

Cincinnati & Muskingum Valley.

This company owns a line from Morrow, O., to Zanesville, 148.4 miles. Up to Dec. 31 last it was leased to the Pittsburgh, Cincinnati & St. Louis Co., but at that time the lease was terminated, as noted below.

The company issues its own report for the year 1885, although during that year all the operations of the road were conducted and managed by the lessee.

The equipment includes 12 locomotives 9 passenger, 1 combination and 4 baggage cars; 62 box, 37 stock, 11 flat, 214 gondola, 29 coal hopper and 4 caboose cars; 1 tool car.

The general account is as follows, condensed:

Capital stock		$3,997,320
Funded debt		1,500,000
Unpaid coupons		78,820
Due lessee for advances		1,081,013
Miscellaneous		124
Total		$6,657,277
Road and equipment	$5,539,014	
Supplies	12.971	
Sundry accounts	5,057	
Cash	26,320	
Income account, debit balance	1,073,915	
	6,657,277	

The funded debt consists of one issue of $1,500,000 first-mortgage bonds, bearing 7 per cent. interest.

The earnings for the year were as follows:

	1885.	1884.	Inc. or Dec.	P. c
Freight	$180,607	$204,482	D. $23,875	11.7
Passengers	112,931	151,613	D. 38 682	25.5
Mail and express	17,473	19,665	D. 2,192	11.1
Miscellaneous	8,634	7,907	I. 727	9.1
Total	$319,645	$383,667	D. $64,022	16 7
Expenses	386,562	425,669	D. 39,107	9.2
Deficit	$66,917	$42,002	I. $24,915	59.3
Gross earnings per mile	2,153	2,585	D. 432	16 7
Per cent. of expenses	120.9	110.9	I. 10.0	....

During the year 884 tons of steel rails, 782 tons of iron rails and 91,807 new ties were put in the track; 17 miles of track were ballasted with gravel. There are now 40 miles of the road laid with steel.

The result of the year was as follows:

Deficit in earnings, as above	$66,917
Interest on bonds	105,000
Total deficit for the year	$171,917

The lessee paid one-half the interest, $52,500, but did not pay the other half on account of the suit pending to annul the lease. The total amount due the lessee for advances up to Dec. 31, 1885, was $1,081,013.

Train miles:	1885.	1884.	Inc. or Dec.	P. c.
Passenger	234,735	263,277	D. 28,542	10.8
Freight	227,646	242,018	D. 14,372	5.9
Other	12,058	14,703	D. 2,645	18.0
Total	474,439	519 998	D. 45,559	8.8
Passengers carried	223,589	292,611	D. 69,022	23 6
Passenger-miles	4,281,479	5,784,718	D. 1,503,239	26.0
Tons freight carried	265,407	247,170	I. 18,237	7.4
Ton-miles	14,299,443	12,945,363	I. 1,354,080	10.5
Av. train load:				
Passengers, No	18.2	22.0	D. 3.8	17.3
Freight, tons	62.4	53.5	I. 8.9	16 6

Of the freight car mileage last year 29.1 per cent. was of empty cars. The earnings per train-mile were 90.57 cents; expenses, 109.53; deficit, 18.96 cents.

The earnings and expenses per unit of traffic were, in cents:

	Per pass.-mile		Per ton-mile	
	1885.	1884.	1885.	1884.
Earnings	2.64	2.62	1.26	1.58
Expenses	4.18	3.35	1.45	1.79
Deficit	1.54	0.75	0.19	0.21

On Dec. 31, 1885, under a decree of Court annulling the lease, the Pittsburgh, Cincinnati & St. Louis Co. surrendered its lease of this road, as has been heretofore noted. An appeal from the decision of the Court, taken by an individual stockholder, is pending. Another suit brought by the trustee under the first mortgage to foreclose the mortgage and sell the road is also pending.